

# The Australian and New Zealand JOURNAL OF SURGERY

Vol. XXI—No. 3

FEBRUARY, 1952

## THE ANAL CANAL AND RECTUM\*

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IN 1926, E. T. C. Milligan a Melbourne Graduate from Ballarat, Victoria, began the work at St. Mark's Hospital which has resulted in the present-day conception of the anatomy of the rectum and anal canal. This great Australian surgeon led the way to a more thorough understanding of the problems encountered in the treatment of ano-rectal conditions and he described clearly the importance of the ano-rectal musculature in such conditions as fistula, haemorrhoids, and fissure (Fig. 1).

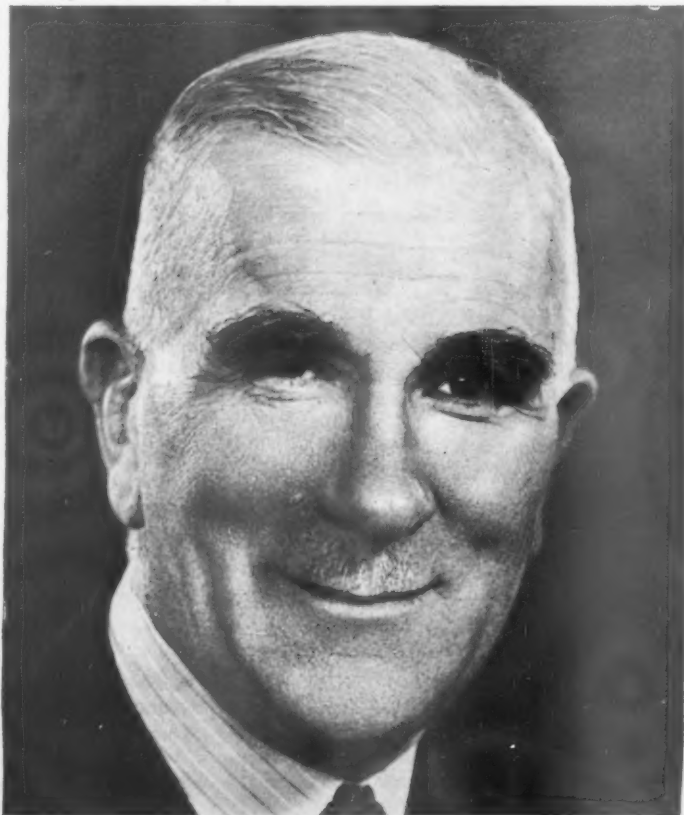


FIG. 1. E. T. C. Milligan.

\*Based on the lectures delivered by Mr. Naunton Morgan during his visit to Australia, 1951.

It is proposed first to review present knowledge of the surgical anatomy of the region; and secondly, to show how this anatomy can be applied in the treatment of certain ano-rectal conditions.

## PART ONE — SURGICAL ANATOMY

### MUSCLES OF THE ANAL CANAL

#### SPHINCTER ANI EXTERNUS.

This muscle is composed of three parts, although sometimes the two deeper layers are fused together (Figs. II and III).

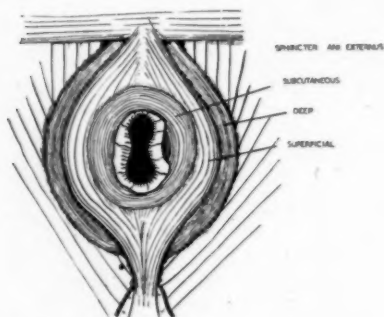


FIG. II. Sphincter ani externus, seen from below. The three parts are indicated. The superficial part is the only part with an attachment to the coccyx.

#### 1. *Sphincter ani externus subcutaneous.*

This is an annular band encircling the lowest portion of the anal canal. It lies in the same plane as the internal sphincter, from the lower border of which it is separated by an annular sheet of fascia, the anal intermuscular septum. It has no attachment to bone and can be seen and felt beneath the skin of the anus.

#### 2. *Sphincter ani externus superficialis.*

This is an elliptical muscle above and more lateral to the subcutaneous portion from which it is separated by the perianal fascia, a prolongation of the longitudinal muscle. It is attached to the dorsal aspect of the terminal pieces of the coccyx, and is the only part of the external sphincter muscle inserted into this bone. As it passes forwards, the muscle splits into two halves which embrace the anus and finally converge towards the central point of the perineum.

#### 3. *Sphincter ani externus profundus.*

This is the upper division of the sphincter. Its uppermost fibres intermingle with those of *m. pubo-rectalis*. The lower edge of the muscle is sometimes separated from the superficial portion of the external sphincter by a fibrous septum derived from the longitudinal muscle.

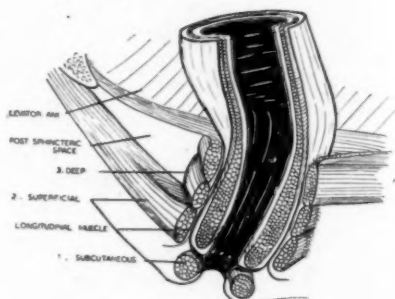


FIG. III. The muscles of the anal canal. The sphincter ani externus and its three parts is shown. The longitudinal muscle ends by dividing into the anal intermuscular septum and the peri-anal fascia. The sphincter ani internus is the thickened lower part of the circular muscle of the rectum. The levator ani, with its three components, the ilio-coccygeus, the pubo-coccygeus, and the pubo-rectalis is shown. The post-sphincteric space is the potential space between the levator ani above and the superficial part of the sphincter ani externus below.

#### LEVATOR ANI MUSCLE.

The levator ani muscle consists of two main parts, the *ilio-coccygeus* and the *pubo-coccygeus* with its specialized part, the *pubo-rectalis* (Fig. IV).

#### 1. *The ilio-coccygeus.*

This portion arises from the ischial spine and from the lateral pelvic wall, as far forwards as the obturator canal. Its origin may be fascial, and the whole muscle thin and degenerate although there is evidence of a great capability of hypertrophy during pregnancy. The muscle fibres pass down and

inwards to gain insertion into the sides of the coccyx and ano-coccygeal raphe.

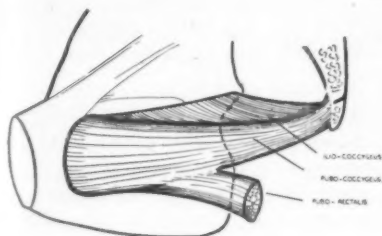


FIG. IV. The levator ani to show the three parts, the ilio-coccygeus, the pubo-coccygeus, and the pubo-rectalis. The drawing is of the side wall of the pelvis, viewed from within.

## 2. The pubo-coccygeus.

This portion arises from the posterior aspect of the pubis, the deep layer of the triangular ligament and from the "white line" as far back as the obturator canal. The fibres pass mainly backwards, and slightly inwards on either side of the visceral canals to join in a V shaped manner to form a raphe attached to the front of the coccyx. The muscle fibres of the *pubo-coccygeus* run in a different direction from those of the *ilio-coccygeus*; the former run backwards, and the latter downwards and inwards. This difference is partly due to the more posterior origin of the *ilio-coccygeus*, and partly to the obliquity of the pelvis.

## 3. The pubo-rectalis.

The *pubo-coccygeus* muscle in its medial and anterior portion is thicker and more vascular than the remainder of the muscle, and forms the *pubo-rectalis*. At its origin, it lies nearly horizontal, with an upper and lower surface, but as it passes backwards it twists so that its upper surface becomes a medial one, and its medial edge inferior. The *pubo-rectalis* fuses with that of the opposite side to form a continuous sling passing behind the ano-rectal junction. This U shaped muscle forms, with the pubic arch anteriorly, the pelvic aperture, no larger than  $1\frac{1}{2}$  inches long and 1 inch wide. The *pubo-rectalis* is important; when it contracts it increases the ano-rectal angle and narrows the aperture.

The subcutaneous, and deep parts of the external sphincter, and the *pubo-coccygeus* and *pubo-rectalis* divisions of the levator ani muscle are supplied by the 3rd and 4th sacral nerves via the internal pudendal nerve. The superficial part of the external sphincter, and the *ilio-coccygeus* division of the levator ani receive their innervation from a branch of the 4th sacral nerve.

## LONGITUDINAL MUSCLE.

The longitudinal muscle of the anal canal is a continuation of the longitudinal muscle of the rectum, reinforced by blending with the fibres of *pubo-rectalis*. This longitudinal muscle ends by dividing into two main septa (Fig. II); one passes between the lower border of the internal sphincter and the subcutaneous portion of the external sphincter, forming the anal intermuscular septum which becomes attached to the skin of the anus, near the muco-cutaneous junction; the other passes outwards to separate the peri-anal space from the ischio-rectal space. Sections show that the longitudinal muscle fans out into numerous septa which pierce the subcutaneous sphincter, but the anal intermuscular septum, and the peri-anal fascia can be defined without difficulty at operation because of their definite composition. Furthermore, the common position of fistula openings, and the sulcus present in the intero-external prolapsed and thrombosed piles give the anal intermuscular septum an important position in surgical anatomy. There is some evidence to show that the longitudinal muscle retains its three taenial thickenings and that this might be a factor determining the usual position of the three main haemorrhoids.

## SPHINCTER ANI INTERNUS.

The *sphincter ani internus* is a direct continuation of the circular muscle wall of the rectum into the anal canal; its lower border extends to within  $\frac{1}{4}$  inch of the anal verge. It is cylindrical in shape, and its well defined and somewhat thickened lower border is easily felt at the level of the anal intermuscular septum.

## LINING OF THE ANAL CANAL AND RECTUM.

## RECTAL MUCOSA.

The epithelium is columnar, pale pink in colour and semi-transparent, allowing the branching veins draining the internal haemorrhoidal plexus to be seen. This type of epithelium covers the pedicle of the pile.

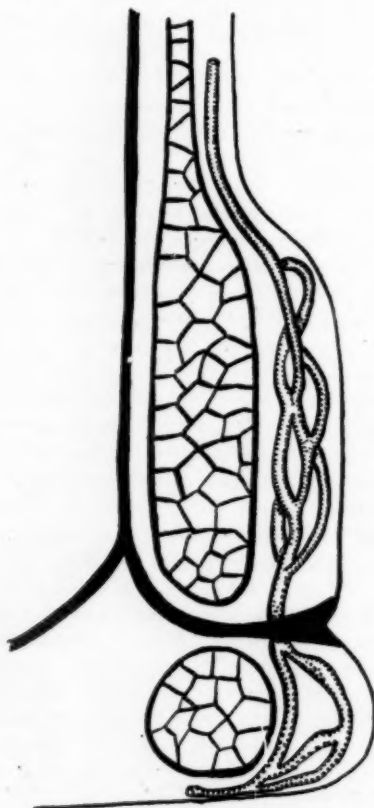


FIG. V. The submucous space.

## ANAL MUCOSA.

At the ano-rectal ring the epithelium becomes cuboidal and plum-coloured, owing to the venous blood in the underlying venous plexus. Just above the anal intermuscular septum, at the "line of Morgagni", the epithelium becomes stratified.

## ANAL CANAL SKIN.

This is dull white and smooth, and adherent to the subjacent tissues; it has the structure of skin, but has no glands or hairs. It merges with the pigmented skin of the anus.

The first portion of a pile to prolapse is that covered by anal skin mucosa which is plum-coloured; rarely does a pile prolapse far enough to allow the pink rectal mucosa to be seen, although this can be identified at operation for piles.

## SPACES IN RELATION TO THE ANAL CANAL AND RECTUM.

1. *Submucous Space.*

The submucous space lies between the mucous membrane and internal sphincter (Fig. V); inferiorly it ends at the anal intermuscular septum whilst superiorly it is continuous above the ano-rectal ring with the submucosa of the rectum. It contains the internal haemorrhoidal plexus.

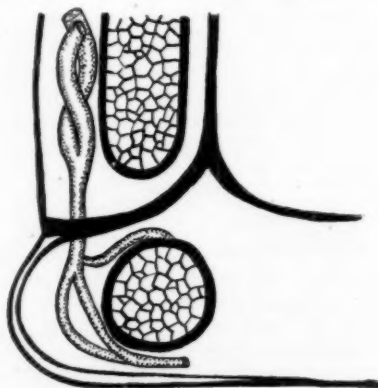


FIG. VI. The peri-anal space.

2. *Peri-anal Space.*

The peri-anal space surrounds the anus (Fig. VI). It is limited above by the termination of the composite longitudinal muscle into the anal intermuscular septum and peri-anal fascia passing outwards between the subcutaneous and superficial portions of the external sphincter. Inferiorly the space



is bounded by the peri-anal skin and the *corrugator ani* muscle; on its inner aspect by the skin of the anus, and on its outer aspect it becomes continuous with the subcutaneous fat. It contains the subcutaneous sphincter and the external haemorrhoidal plexus; the latter communicates with the internal haemorrhoidal plexus through small deficiencies in the anal intermuscular septum. Pathological lesions of the peri-anal space are common, for example, haematomata, infections, and fissures.

### 3. Ischio-rectal Space.

The ischio-rectal fossa is divided into the peri-anal space, and the ischio-rectal space by the peri-anal fascia extending out from its origin from the composite longitudinal muscle towards the ischial tuberosity. The fat of the peri-anal space is closely packed, and finely granular, whereas the ischio-rectal space is filled with large locules of relatively avascular fat.

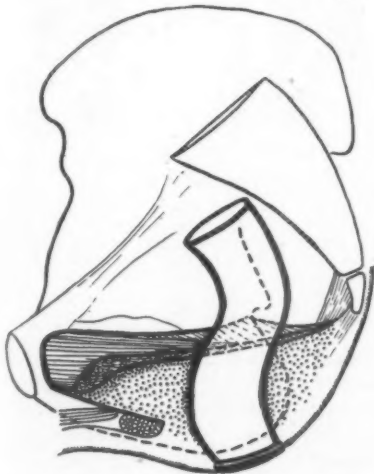


FIG. VII. The ischio-rectal space. Note that it is "wedge" shaped, with the base of the wedge posterior, and the apex of the wedge anteriorly behind the pubis.

The ischio-rectal space is wedge shaped (Fig. VII), lying antero-posteriorly, with its apex passing forwards, and its base lying posteriorly. The base of the wedge is directed backwards and downwards; here the ischio-rectal space is broadest, is partly overlapped

by the gluteus maximus, and limited by the peri-anal space and skin. The apex of the wedge is situated above the triangular ligament, between the side of the pelvic aperture and the descending pubic ramus. The floor of the space, posteriorly, is the peri-anal fascia

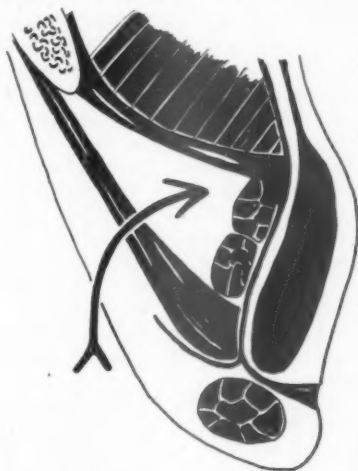


FIG. VIII. The post-sphincteric space, through which the ischio-rectal fossa on one side communicates with that on the other. The space is triangular on section, with the upper boundary formed by the levator ani, the lower by the attachment of the superficial part of the external sphincter to the coccyx, and anteriorly lies the deep part of the external sphincter and the puborectalis.

which separates it from the peri-anal space; anteriorly, the triangular ligament and the perineal muscles form a shelf below the anterior extension of the ischio-rectal space. The inner wall of the ischio-rectal space is formed by the *pubo-coccygeus* and the *puborectalis* together with the two deeper portions of the external sphincter; posteriorly, behind the anus, this inner wall disappears, and so the ischio-rectal spaces communicate with one another in this region. This communication lies between the ano-coccygeal raphe of the levator ani, and the coccygeal attachment of the subcutaneous part of the external sphincter; this has been termed the post-sphincteric space (Fig. VIII). The outer wall of the ischio-rectal space is limited by the obturator fascia covering its muscle, and by a small portion of the inner aspect of the ischium which lies below the falciform

attachment of the sacro-tuberous ligament. The roof is arched, and is formed by the changing direction of the fibres of the levator ani muscle as it passes inwards to its insertion. The roof is broadest in the posterior part of the spaces and becomes narrower anteriorly above the triangular ligament. At the apex the inner wall and roof merge with one another because the *ilio-coccygeus* and *pubo-coccygeus* are in apposition at their origins from the "white line." The outer wall and floor also approach the inner wall and roof at this point. Some anatomists have described the presence of a layer of fascia, the *lamina terminalis*, passing across the ischio-rectal space from its inner to outer wall at the base of the triangular ligament. This would limit the ischio-rectal space to the level of the base of the triangular ligament; but such exclusion of the anterior extension of the space has not been supported by clinical observation and operative findings in cases of infection in the ischio-rectal fossa.

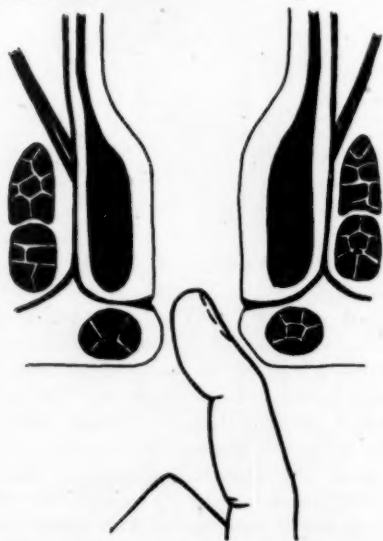


FIG. IX. Palpation of the anal intermuscular septum. The distal interphalangeal joint is still outside the anus.

#### PALPATION AND RECOGNITION OF THE ANAL MUSCULATURE.

##### 1. *Sphincter ani externus subcutaneous.*

This muscle is easily palpable in its whole extent; it is round, about a quarter of an

inch in thickness. This is the only part of the external sphincter which is subcutaneous, and definitely palpable throughout.

##### 2. *Anal Intermuscular septum.*

At the upper and inner edge of the subcutaneous sphincter is a well marked depression,  $\frac{1}{4}$  to  $\frac{1}{2}$  inch width, the anal intermuscular septum (Fig. IX). Above is the lower edge of the internal sphincter which can be demonstrated if the subcutaneous sphincter be retracted outwards with the finger; the lower border of the internal sphincter can then be seen closing the anal canal in its lower part.

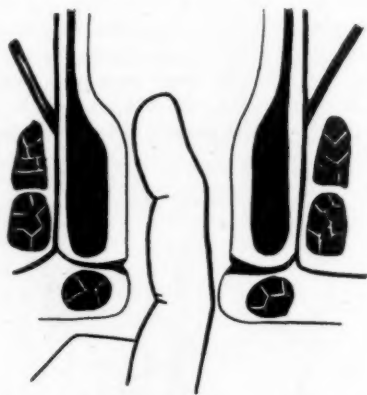


FIG. X. Palpation of the ano-rectal ring. The proximal interphalangeal joint is level with the anus. Anteriorly the levator ani is deficient and the ano-rectal ring is at a lower level.

##### 3. *Ano-Rectal Ring.*

Situated at the junction of the anal canal and rectum it is a composite fibro-muscular band composed of the upper part of the internal sphincter, the longitudinal muscle, *pubo-rectalis*, and the deep part of the external sphincter (Fig. X). The posterior half of the ring is easily defined because of the sling-like fibres of *pubo-rectalis*; anteriorly where there is no *pubo-rectalis*, the ring is formed by the deep external sphincter, and is not so easily felt. On withdrawal of a proctoscope, the ano-rectal ring contracts as the end of the instrument reaches the junction, and a ring of mucous membrane appears.

## PART TWO—FISTULA, HAEMORRHOIDS, AND FISSURE.

A fistula-in-ano is the contracted cavity of an abscess, which, failing to heal completely, leaves usually an external opening, a main track and an internal opening. There may be secondary tracks and secondary external openings.

The cause of the fistulae remain undetermined in most cases. Approximately 12 per cent. of fistulae prove to be tuberculous; and in such patients, the primary source is often evident. Mucosal glands of the anal canal sometimes extend into the muscles of the sphincter, and infection of this intramuscular gland may be the origin of some fistulae.

A simple practical classification of fistulae-in-ano was described in 1934 and has since been followed in clinical practice. This classification is based on the relation of the main track to the musculature of the sphincter.

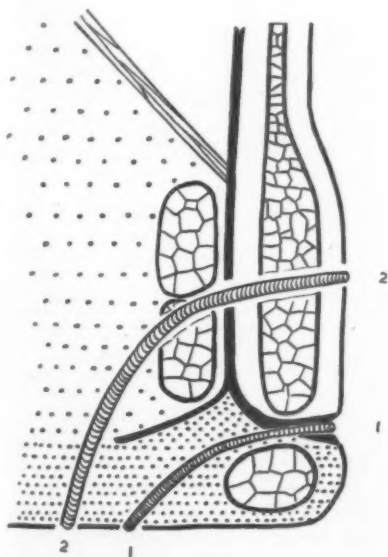


FIG. XI. Low anal fistula (1) and high anal fistula (2).

#### 1. Subcutaneous and Submucous Fistulae.

These are not common and together constitute about 5 per cent. of fistulae in the

region. The main track lies under the skin or the mucous membrane, and superficial to all the sphincter muscles.

#### 2. Low Anal Fistulae.

Most fistulae-in-ano enter the anal canal at its lower end just above the subcutaneous external sphincter in the region of the anal intermuscular septum. These are termed low-anal fistulae and account for 75 per cent. of anal fistulae (Fig. XI).

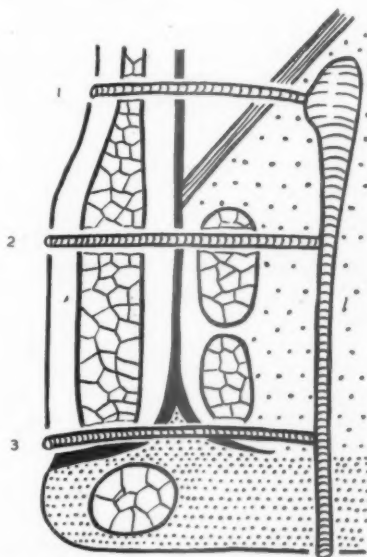


FIG. XII. Ano-rectal fistula. The main track might be blind, without any communication with the anal canal or rectum; it may have a track entering the rectum, above the levator ani (1), a track entering the anal canal just below the ano-rectal ring (2) or at the level of the anal intermuscular septum (3).

#### 3. High Anal Fistulae.

This type of fistula is less common (15 per cent.). The main track enters the anal canal somewhere between the anal intermuscular septum and the ano-rectal ring, usually high up in the midline posteriorly, just below the ano-rectal ring (Fig. XI).

#### 4. Ano-Rectal Fistulae.

This term is given to a small number of cases (5 per cent.) where the main track

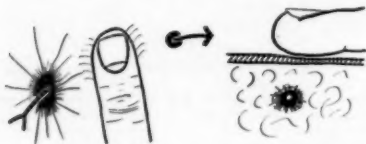
extends above the ano-rectal ring. There are three varieties of ano-rectal fistula (Fig. XII).

Very rarely there is an internal opening into the rectum itself; this variety, also known as a pelvi-rectal fistula, seems in most instances to be the end result of a mis-judged operation for fistula or for abscess.

In the second type, although the main track extends above the ano-rectal ring, the opening into the bowel lies somewhere below that level.

In the third variety, the main track exists but no communication with the anal canal or rectum can be found. When no internal opening can be determined the cure rate drops from 100 per cent. to 50 per cent.

The type of fistula can be diagnosed in most instances by simple clinical means. The external opening is usually obvious with pouting raised granulation tissue giving a purulent discharge, but occasionally the external opening is small with no protruding granulations and admitting only a very fine probe. The external opening may heal, and then appear as an inconspicuous dimple, and admission of the probe to the underlying track can only be gained when the dimple is excised. Irregular undermining ulceration is characteristic of tuberculous infection.



RELATION OF TRACK OF FISTULA

FIG. XIII. The palpation of the fistula track is important in the diagnosis of the type of fistula.

The direction and course of the fibrous track can be palpated through the skin and followed towards the anus (Fig. XIII). This certainly applies to subcutaneous and low anal fistulae, and also to most cases of high anal fistulae. When difficulty is experienced in feeling the track, it suggests a tuberculous fistula, a fistula track which has epithelialised or an ano-rectal fistula.

The internal opening of a fistula is more easily discovered by light palpation of the anal mucosa with a finger in the anal canal than by inspection with the proctoscope. It may be felt as a slight roughness, an indurated, irregular ulcer, a hard fibrous dimple or rounded projection in the attached mucous membrane.

In some cases the opening, although present, cannot be palpated, but a probe passed through the main track will enter the anal canal, or the point of the probe can be felt in the submucosa through the healed and intact mucous membrane. For safe surgical treatment, the exact relationship of the internal opening and main track to the ano-rectal ring must be determined. A probe is not essential in the diagnosis of fistula-in-ano; it should always be used with the utmost care. In low anal fistulae the probe lies almost horizontal; in ano-rectal fistulae the probe extends upwards parallel with the rectum (Fig. XIV).

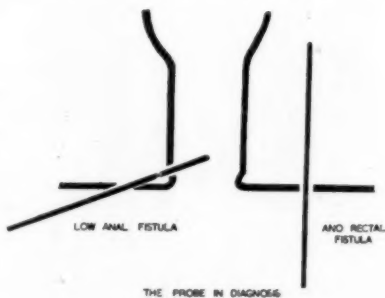


FIG. XIV. A probe is usually unnecessary in making the diagnosis of a fistula, but is valuable in deciding which type of fistula is present.

A fistula-in-ano results from the failure of an abscess in this region to heal by third intention, that is to say, by adherence of the walls of granulation tissue. It is common experience to see supra-pubic vesical fistulae, and caecal fistulae healing without assistance. But this is uncommon with fistulae-in-ano because the granulation tissue coming together along the walls of the fistulous track forms pockets, the source of recurrent sepsis and persistent fistula track. Wounds heal well by second intention, however, and fistulae-in-ano are cured by laying open the fistula track and converting it into a flat granulating area. In the convalescent phase

it is necessary to avoid bridging and pocketing of the wound, especially at the anal verge, that is, to prevent any tendency of the wound to revert to third intention healing. The fistula is incised along its whole track, with division of all the overlying tissues from external to internal opening. The overhanging skin edges are excised so that a flat wound is obtained. Technically this is simple when the openings and main track have been identified but difficulties arise when a considerable mass of muscle lies superficial to the fistula and so would be cut in order to lay open the track.

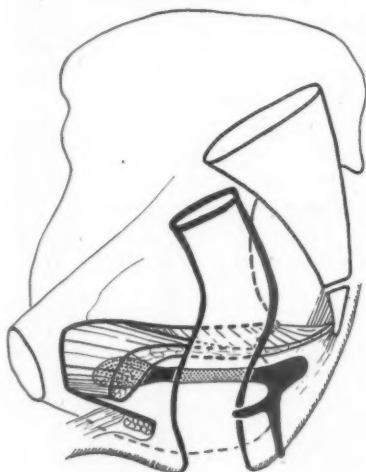


FIG. XV. An ano-rectal fistula; note how the track is roughly level with the coccyx. It lies in the ischio-rectal space and may extend well forwards above the triangular ligament.

A subcutaneous fistula presents no difficulty; a submucous fistula is better treated by the ancient method of destroying the roof by strangulating ligatures. To cure a low anal fistula only one muscular component of the external sphincter requires division, the functionally unimportant subcutaneous sphincter.

A high anal fistula is a more difficult problem. The main track usually enters the anal canal at its upper part in the posterior segment just below the ano-rectal ring; the tracks are often curved, horseshoe or semi-horseshoe in shape. The main concern in treatment is to determine the exact relation of the internal opening to the ano-rectal

ring. A probe passed along the main track into the anal canal will be felt to lie just below the ano-rectal ring. It requires courage to cut all the muscles down to the probe when the internal opening lies near the ano-rectal ring. If there is any doubt at all about the possible integrity of the ano-rectal ring after this procedure, the probe should not be completely liberated by dividing all the anal muscles but repeated examinations in the convalescent phase may confirm beyond doubt the relation of the opening. The opening can be more easily identified by loosely inserting a ligature down the track and through the internal opening, and leaving it in situ. It seems that the subcutaneous and superficial portions of the external sphincter, and part of the deep, as well as related parts of the internal sphincter, can be cut with impunity.

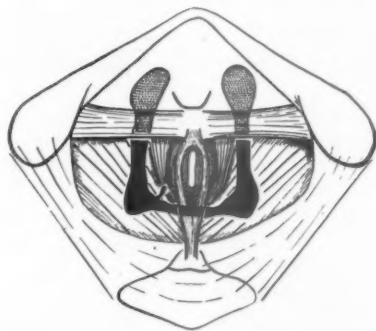


FIG. XVI. An ano-rectal fistula; this is the horseshoe variety, and the diagram shows the two halves communicating via the post-sphincteric space. It also shows a bilateral extension forwards above the triangular ligament.

Ano-rectal fistulae are the most difficult. Anatomical considerations prevent the conversion of such deep tracks in the ischio-rectal fossa into flat wounds. The track is guttered and advantage is taken of the fact that the roof of the ischio-rectal space is situated nearer the skin posteriorly than anteriorly owing to the way in which the levator ani is inserted (Figs. XV and XVI). In fact the skin in the region of the coccyx is on the same horizontal plane as the depths of the ischio-rectal fossa including its anterior extension. Because the roof of the ischio-rectal space lies nearer to the skin, and its inferior wall or floor is here formed by the peri-anal skin and space, the first

incision to be made at operation for ano-rectal fistula is one directly back to the side of the coccyx (Fig. XVII). By retraction of the wound edges, the depths of the space can be seen and the anterior extension along the *pubo-coccygeus* and *pubo-rectalis* found by palpation and with a probe. This anterior extension is opened up by cutting down on the probe in a forward direction through the floor of the anterior part of the ischio-rectal fossa. This incision will not only further open up the perianal space but may divide the transverse perineal muscle and base of the triangular ligament. The track to the other side along the *pubo-rectalis* exists in two-thirds of cases and is laid open by division of the skin, peri-anal space, and the attachment of the superficial external sphincter behind the anus to the coccyx. Since the main track and its extension to the opposite side lie close to the bowel, the rectal wall must be protected from injury whilst incisions are being made, and this is

aided by a finger in the anal canal and rectum. An internal opening below the ano-rectal ring can be found in 75 per cent. cases, and is laid open in the way described for high anal fistulae. After the edges of the incisions are cut away the resulting wound is very large but heals well; the average time in hospital is eight weeks.

The *pubo-rectalis* and *pubo-coccygeus* muscles are so often infiltrated by inflammatory induration that palpation from within the rectum may give the impression that the infection is situated in the submucous space. This is not the case, however, because the induration felt in such cases is at the level of the ano-rectal ring and does not extend downwards in the submucous space into the anal canal.

#### HAEMORRHOIDS.

It is useful to recognize three degrees of haemorrhoids. In first degree haemorrhoids the patient bleeds but without knowledge of any prolapse (Fig. XVIII, 2). In the

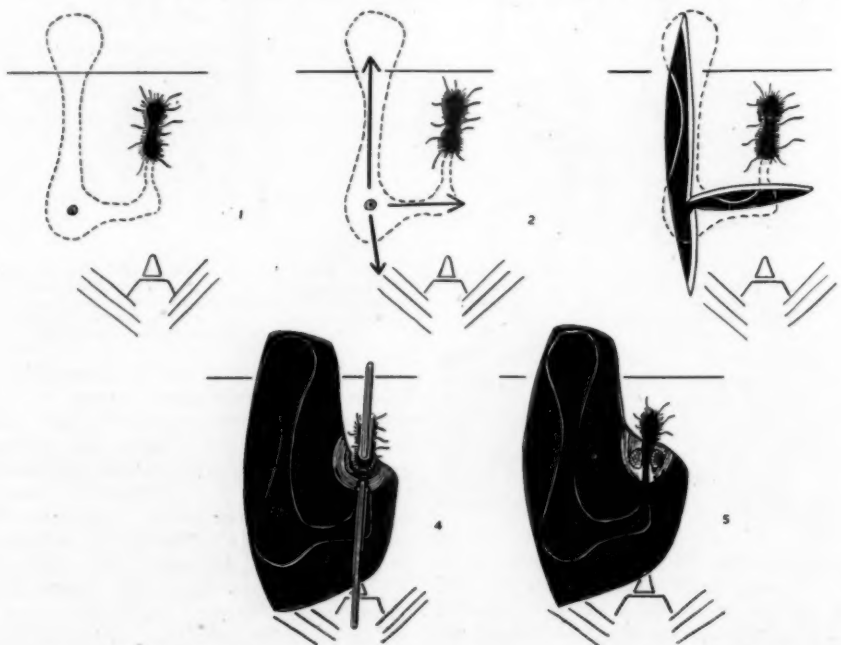


FIG. XVII. The stages in the operation for ano-rectal fistula. The fistula is shown in 1; the first cut is made back towards the coccyx, and this enables the anterior extension of the track to be defined with a probe and laid open, as well as the medial extension, 2 and 3; the skin edges are excised to render the wound as flat as is possible, 4; and finally the opening into the bowel is defined, and laid open, 5.



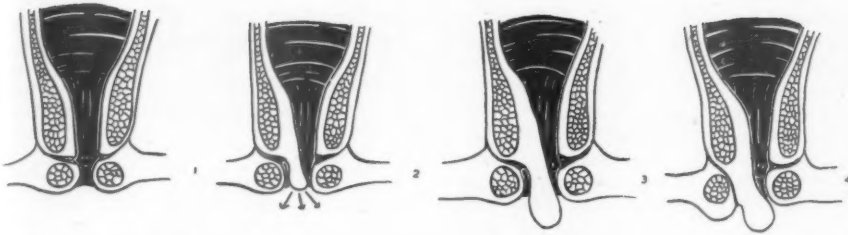


FIG. XVIII. Haemorrhoids are divided into three groups, first degree (2), second degree (3), and third degree (4). Note the difference in the anal intermuscular septum in the latter two.

second degree cases, the patient may bleed but he is also aware that piles prolapse; the piles return spontaneously at the end of the bowel action (Fig. XVIII, 3). In third degree piles, the mucous membrane prolapses and stays out (Fig. XVIII, 4); in these cases it is suggested that the longitudinal muscle has become stretched, and can no longer act as a restraining influence. In a third degree haemorrhoid a groove running transversely across the surface can always be seen and represents the anal intermuscular septum.

Injection treatment has a definite place in treatment, the more so because of the present shortage of hospital beds. Many patients obtain long periods of relief, especially from bleeding. Up to 10 cc of 5 per cent. phenol in almond oil are injected into the pedicle of the pile and injections may be repeated after three or four weeks. First and second degree piles respond best, but there is no contra-indication to injecting third degree cases as a palliative procedure.

The St. Mark's ligature and excision operation for haemorrhoids is the outcome of work done by a group of surgeons which included

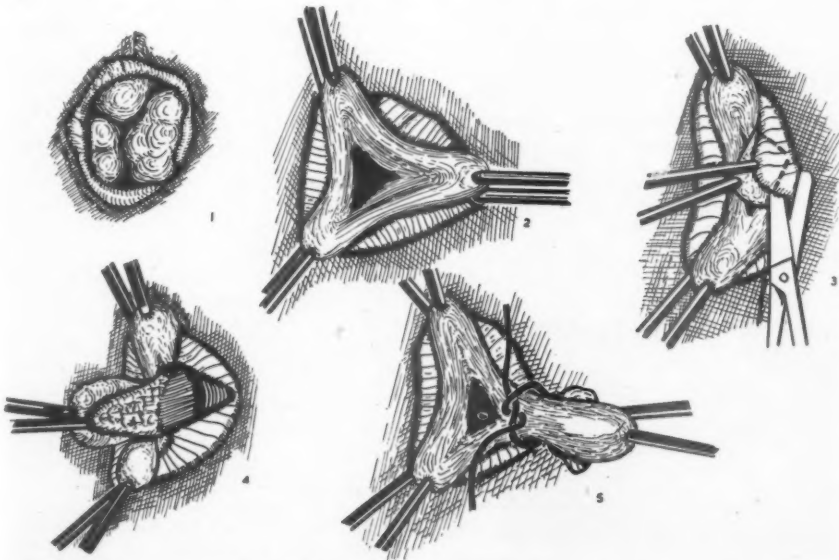


FIG. XIX. Ligature and excision of left lateral haemorrhoid. The three main haemorrhoids are seen in 1; Milligan's triangle of exposure in 2; the skin cut in 3; the subcutaneous part of the external sphincter and the anal intermuscular septum are displayed in 4, with retraction of the triangular skin flap; the ligature of the internal haemorrhoid. The same procedure is carried out on each of the three haemorrhoids, which are then excised distal to the ligature.

two Australians, E. T. C. Milligan and Robert Officer, both Melbourne graduates. The main steps of this operation are shown in Fig. XIX. Without any preliminary dilatation of the anus, the anal mucosa is pulled downwards until the pink rectal mucosa is seen. This is done in the three pile zones and a triangle of pink mucous membrane is displayed—Milligan's triangle of exposure (Fig. XIX, 2). Artery forceps are placed on the peri-anal skin corresponding to the three internal haemorrhoids. A finger is inserted into the anus, and with the pulp identifying the subcutaneous sphincter, a U shaped cut is made in the skin (Fig. XIX, 3). The triangular flap of skin so outlined is hinged on the anal intermuscular septum, and carries with it the external haemorrhoidal plexus (Fig. XIX, 4). The subcutaneous sphincter is identified together with the longitudinal fibres of the anal intermuscular septum. By including the latter in the ligature upward retraction of the internal haemorrhoid is prevented after it has been excised. Each of the three piles are treated in the same way, care being taken to preserve skin and mucous membrane bridges between each wound.

#### FISSURE-IN-ANO

The cause of fissure-in-ano may be inco-ordination of the components of the external sphincter. The superficial portion of the external sphincter is V shaped posteriorly and the subcutaneous sphincter lying below it is

circular. Each has a different nerve supply and failure to relax synchronously in defaecation might leave the subcutaneous sphincter stretched tightly across the angle of the V; in such circumstances the overlying mucous

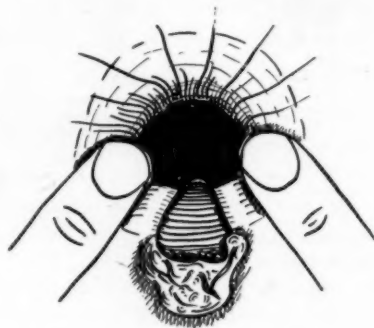


FIG. XX. Chronic fissure-in-ano; the circular muscle fibres of the subcutaneous part of the external sphincter are shown, together with a skin tag.

membrane is torn and a fissure forms. In chronic fissures the circular fibres of the subcutaneous sphincter can be seen (Fig. XX), and their presence is a clear indication for surgery; the most satisfactory operation is excision of the fissure and division of the subcutaneous sphincter. In acute fissures the fibres in the floor of the triangular ulcer are radial in their direction and are derived from the longitudinal muscle. Such fissures might respond to more conservative measures.

## FIVE CASES OF "ADENOCHONDROMA" OF THE LUNG.

By A. V. JACKSON.

*Pathology Department, Alfred Hospital, Melbourne.*

**I**N 1883, Chiari, during routine autopsy of a female aged 68, noted a cartilaginous tumour, 2 cm. in diameter, in the lower lobe of the left lung. The cartilaginous mass which was calcified in places also included some fat and scattered glands.

In 1949, Jones reviewed the literature and found reports of 107 benign pulmonary tumours which had been given various names such as adenochondroma, lipochondroadenoma, hamartochondroma and other complex descriptive terms which indicated both a mixed histology and also that cartilage was, in the majority of these tumours, the most prominent constituent. Most of the reported tumours were small, only a few being more than 5 cm. in diameter. Nearly all were sub-pleural in position; that is, they were at the periphery of the lung rather than near the hilum where bronchial cartilage is normally present in greatest amount. Though microscopic examination of some showed "active" looking areas, not one of the 107 cases showed the final proof of malignancy, metastatic spread. Most of them had caused no signs or symptoms and were incidental findings at autopsy or were discovered during mass X-ray surveys. Though not common, these tumours are likely to be discovered in increasing numbers with the more widespread use of routine radiological examination to exclude symptomless pulmonary tuberculosis. The increasing clinical importance of what was once only a pathological oddity prompted the following report of five cases.

### CASE REPORTS.

#### *Case 1.*

Charles C., aged 46, had a slight morning cough but was otherwise well. X-ray of his lungs during a mass survey on 13th Feb., 1951, revealed a "small, roughly rounded opacity in the left lower lobe. Has a little calcium associated with it and may be a tuberculoma." Mantoux test was positive with a dilution of 1:1000 old tuberculin. A further X-ray on 17th Feb. (Fig. I.), was reported thus: "spherical opacity with slightly irregular margins anteriorly in the base of the left lower chest about

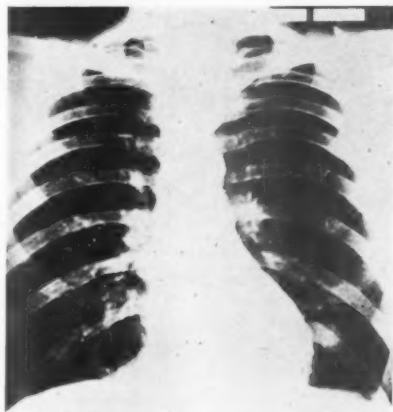


FIG. I. X-ray photograph of the chest in Case 1, showing a rounded shadow in the left lower lobe.

one inch above the hemidiaphragm. Some calcification also apparently present. Calcification laterally in the pleura and subpleural margin at about the same level. Small pleural adhesions laterally and anteriorly at left base. Remainder of lungs normal. ? Tuberculoma. ? Hydatid. ?? Neoplasm." Repeated attempts to find tubercle bacilli in the sputum were unsuccessful. On 5th Apr., the left pleural cavity was opened and a tumour, 2.5 cm. in diameter, found in the base of the inter-lobar fissure. It was embedded in lung tissue but shelled out without difficulty and there was no bronchus or other prominent structures near it. The mass was hard, bluish-grey in colour with a suggestion of lobulation and resembled hyaline cartilage (Fig. II.).

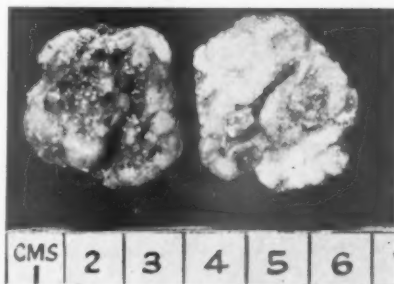


FIG. II. Photograph of the excised tumour (Case 1), showing lobulated and glistening cartilage.

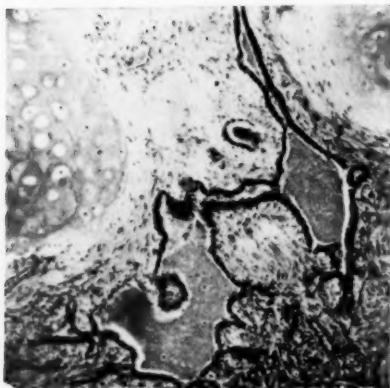


FIG. III. Photomicrograph of a section of part of the tumour (Case 1). Note the cartilage, epithelium-lined clefts, lymphoid tissue and the absence of a capsule (x 30).

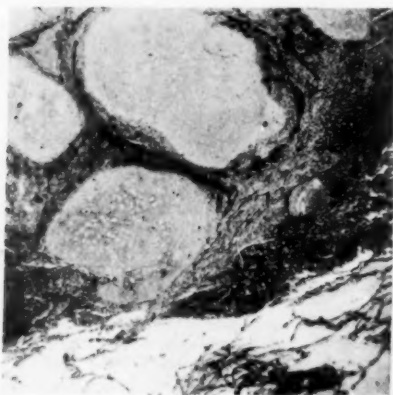


FIG. IV. Photomicrograph of a section of the same tumour (Case 1), showing cartilage, epithelium and fibrous tissue. (x 85).

Histologically (Figs. III. and IV.), it was composed of roughly spherical masses of hyaline cartilage separated by irregular branching clefts lined in places by simple columnar epithelium; in others, by well differentiated pseudo-stratified ciliated columnar epithelium (Fig. V.). The cartilage was not demarcated, as in normal adult bronchial cartilage, by a well-defined perichondrium. Instead, it merged gradually into the surrounding fibrous tissue which condensed, in places, into small, round avascular masses with slightly basophilic intercellular substance. Some of the cells in these fibrous masses were round like cartilage cells, had around them a more deeply basophilic concentration of intercellular material and it was, in fact, very difficult to say where cartilage ended and fibrous tissue began. There were a few small scattered groups of adult fat cells and a few mucus

secreting glands were seen beneath the epithelium of the clefts. The whole complex was surrounded by a collar of lymphoid tissue which was deficient at a few points and allowed cartilage to abut directly on to lung alveoli but which otherwise separated the cartilage from the surrounding lung. There was no sign of any fibrous tumour capsule but in spite of this there was no evidence of any infiltration and the various parts of the tumour were so well differentiated that malignancy could be confidently excluded. Five months after operation, the patient was well with no clinical or radiological signs of a recurrence.

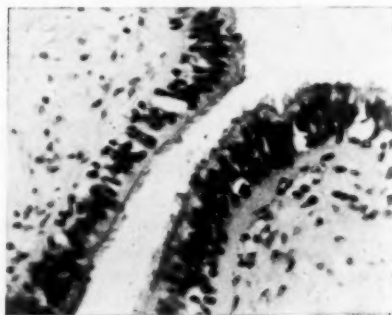


FIG. V. Photomicrograph of the same tumour (Case 1), showing the pseudo-stratified ciliated columnar epithelium which is lining the clefts. (x 250).

#### Case 2.

I.G., a male, aged 18,\* was called up for Army Service on 16th Feb., 1944. Routine X-ray of chest showed a circular opacity immediately to the right of the trachea at the level of the first intercostal space. Five months later the radiological appearance of the lesion was unchanged. Mantoux, Casoni and Hydatid complement test were negative. Hydatid cyst or benign tumour of the lung were regarded as probable alternative diagnoses. He next presented to hospital on 17th July, 1947, complaining of slight pain in the shoulder. This had been present for only a few days and disappeared without treatment in a fortnight. No other chest symptoms had developed. X-ray of the chest showed the opacity had increased slightly in size during the preceding three years. Operation was decided upon—and a stony-hard, lobulated spherical mass was felt in the medial part of the right upper lobe. A right upper lobectomy was performed and the patient made an uneventful recovery. The lobe was cut after fixation in formalin and a tumour, 7 cm. by 5 cm., found underneath the pleura in the sub-pleural segment of the lobe (Fig. VI.). It was encapsulated and

\*This case was recorded by Dr. I. H. McConchie in December, 1948, *Royal Melbourne Hospital Clinical Reports*, vol. 19, page 29. I am indebted to him and to Mr. J. I. Hayward for permission to include it in this series.



FIG. VI. Photograph of the upper lobe of the right lung showing, on section, the cut surface of a partially ossified cartilaginous tumour.

spherical with a lobulated edge and surrounded by compressed lung tissue. The cut surface consisted mainly of numerous islands of cartilage, some of which were gritty due to deposition of calcium. In one area bone was present and between the islands the tissue varied—in parts it was mucoid, in parts cellular and in parts fibrous. The tumour had no obvious bronchial connections.

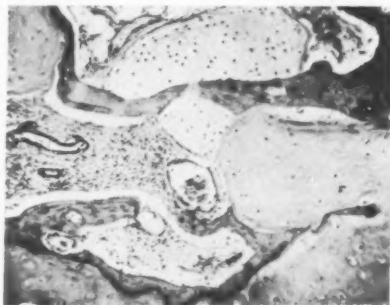


FIG. VII. Photomicrograph of portion of the tumour (Case 2). Note the bone forming partly in cartilage and partly, apparently, "in membrane."

Histologically, it resembled, in general, the tumour from Case 1. It showed rather more fat and less lymphoid tissue and had as an additional feature not seen in specimen 1, a number of thin, irregular trabeculae of well-formed bone (Fig. VII.). Also, in contrast to specimen 1, much of the cartilage was surrounded by a well-defined perichondrium. There was no histological evidence of malignancy. Nine months after operation, the patient had no pulmonary or other significant symptoms.

### Case 3.

Thomas M, aged 48, had a somewhat complex medical history which will not be recorded in detail here because it is fairly clear that none of his symptoms or signs was related to the solitary cartilaginous pulmonary tumour which was found at autopsy. In brief, he complained, twelve months before his death, of enlarged lymph nodes in the neck. Histological examination of an excised lymph node showed lymphosarcoma. Temporary improvement followed deep X-ray therapy. He



FIG. VIII. Photograph of a cross section of the lower lobe of the right lung, showing cut surface of the cartilaginous tumour which is well demarcated from the lung but is not encapsulated.

later complained of precordial pain and he died on 30th Apr., 1951. Autopsy showed coronary thrombosis and myocardial infarction. There was lymphosarcomatous enlargement of superficial and deep lymph nodes and of the spleen. The lungs, apart from a little basal congestion, were normal except for a spherical tumour, 2 cm. in diameter, in the lower lobe of the right lung just below the surface in the mid axillary line (Fig. VIII.). It was so loosely attached to the surrounding lung that when it was bisected, half was displaced, by accident, out of its pulmonary bed. To naked eye examination, the specimen was indistinguishable from that from Case 1 and the histological resemblance (Fig. IX.) was equally close except that this Case 3 specimen had even more lymphoid tissue which, in places, formed lymph follicles with "germinal centres" whilst fat was apparently lacking—no fat cells being seen in the sections examined. It showed no evidence of malignancy.



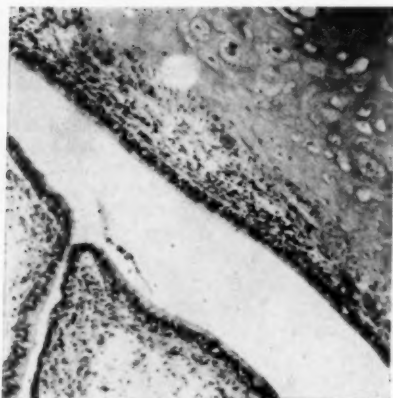


FIG. IX. Photomicrograph of a section of the tumour (Case 3), showing cartilage and epithelial clefts. (x 85).

#### Case 4.

N.P., male aged 59, was admitted to hospital on 7th Apr., 1950, complaining of pain in the chest for seven weeks and cough with blood-stained sputum for three weeks. Clinical and radiological examination indicated an inoperable carcinoma of the lung and he died one week after admission to hospital. Autopsy confirmed the clinical diagnosis of bronchial carcinoma.

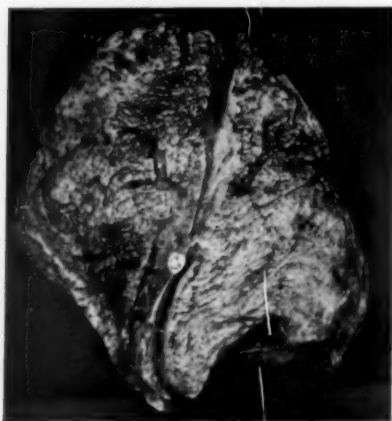


FIG. X. Photograph of the left lung (Case 4). There is a small tumour showing through the pleura, just above the interlobular fissure.

Histological examination showed a diffusely spreading adenocarcinoma. Besides the carcinoma, there was also in the lung a tumour which was macroscopically and microscopically quite different. This was a hard ovoid lump, 4 cm. in greatest diameter, just underneath the pleura on the lateral

surface of the left upper lobe (Fig. X.). This, like the previous specimens, consisted of masses of cartilage separated by epithelial lined clefts. It differed from specimen 1 only in having a relatively greater amount of fibrous stroma and less cartilage and in having, apparently, no lymphoid tissue or fat. It appeared quite benign.

#### Case 5.

The patient was a male soldier about 50 years old who died in 1945 at an Army hospital in Brisbane. Death was from cardiac failure and an incidental finding at autopsy was a solitary nodule, 1 cm. in diameter, just underneath the pleura of the right lower lobe. There was no record of any symptoms or signs referable to the nodule. It had all the macroscopic and histological features of Specimen 1, differing only in the relatively larger amount of fat (Fig. XI.) in the absence of lymphoid lining and in the fact that the fibrous tissue in places was strikingly acellular, appearing to consist only of loosely whorled collagen fibres. There was no evidence of malignancy.

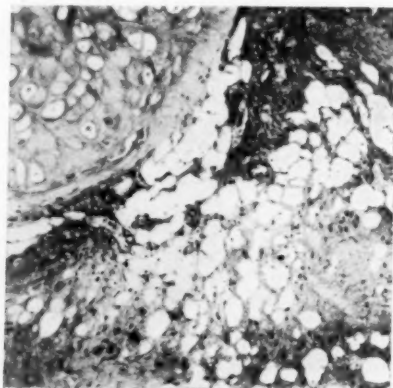


FIG. XI. Photomicrograph of a portion of a tumour (Case 5). Note the cartilage and the numerous fat cells. (x 85).

#### DISCUSSION.

The above account adds nothing new to previous descriptions of pulmonary "hamartomata." From the surgical point of view, these tumours are of some importance because they may need to be considered in the differential diagnosis of rounded opacities in chest radiographs. As a rule, their operative removal, either by local excision or lobectomy, presents no difficulty. When there are no other contra-indications they should be removed because, though benign, they may increase in size and eventually



cause bronchial obstruction or other complications.

To the pathologist, the interest in these tumours centres round the problem of nomenclature and the manner of their origin. In current literature their most popular

assumption that these lung tumours are initiated in utero by genetic or other mysterious "developmental" influences. In this connection it is worth noting that of all recorded specimens only the one described by Jones (1949) was seen in a patient less than 21 years old.

TABLE 1.

## SUMMARY OF HISTOLOGICAL APPEARANCES

	Hyaline Cartilage	Fibrous Tissue	Lymphoid Tissue	Fat	Epithelium	Bone
CASE ONE	++	+	++	+	++	—
CASE TWO	++	+	+	++	++	+
CASE THREE	++	+	+++	—	++	—
CASE FOUR	+	++	—	—	++	—
CASE FIVE	++	+++	—	+++	++	—

designation is "hamartoma"\*—a term first introduced by Albrecht in 1904. By hamartoma, Albrecht meant a tumour-like malformation containing an abnormal mixture of the normal components of the organ in which it was found. This definition distinguishes a hamartoma from a teratoma which, of course, may contain tissues not normally present as, for example, skin or choroid plexus in an ovarian "dermoid." The word might seem to be a useful one but it is difficult to determine the limits of its application. For example, are mammary fibroadenomata really adenomata with a large amount of fibrous "stroma" or may they be called hamartomata? Uterine myomata contain, besides smooth muscle, also fibrous tissue and blood vessels and we rather arbitrarily assume that the muscle is the "parenchyma" and the fibrous tissue and blood vessels the "stroma." But is this necessarily correct? The same queries are relevant to the problem of nodules in prostate and thyroid. We know more about the hormones controlling extra-uterine growth of, and changes in, the thyroid, breast, uterus and prostate, than we do about hormonal or other unknown factors which may modify the structure of the lung—but this ignorance does not justify the

For these reasons I consider that, in the present state of our knowledge, a simple and partially descriptive term such as adenochondroma is adequate and least open to criticism because cartilage and epithelial lined spaces are the most striking and most constantly present features of these pulmonary tumours (Table 1). If a fully descriptive label is attached to each specimen one gathers eventually a mixed bowl of such luxuriant and unclassifiable blooms as "adenofibrochondrolipoma" and "chondrofibromyxoeipitheliome" (Möller, 1933). At the other extreme, the blanket "hamartoma" is equally unsatisfactory for classification because, by definition, it must cover such divergent lesions as not only the lumps in the thyroid, breast, prostate and uterus already discussed but also, to mention only a few, osteochondromata, haemangiomas and dermal naevi.

## SUMMARY.

1. Five cases of adenochondroma of the lung are reported. Two were discovered during routine X-ray examination and removed surgically. Three were chance findings at autopsy. None had caused symptoms. All were histologically benign.

\* *Χαροτιον* = bodily defect.

2. The reasons for using the name "adenochondroma" are discussed.

#### ACKNOWLEDGEMENTS.

I am very much indebted to Mr. K. N. Morris, Dr. J. D. Hicks, Dr. K. Bottomley, and Mr. J. Hayward for putting clinical and autopsy material at my disposal, and to Mr. J. G. Guthrie and Mr. T. O'Connor for the photography.

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## PSEUDO-GLIOMA, RETINITIS AND RETRO-LENTAL FIBROPLASIA.\*

By KEVIN O'DAY.

Melbourne.

PSEUDO-GLIOMA is the general name given to those diseases of the eye in infancy clinically resembling a glioma (retino-blastoma). The outstanding sign of a glioma is the yellow reflex from the pupil—the so called “amaurotic cat’s eye,” due to reflection of light from the tissue of the tumour projecting forwards into the vitreous. It is the presence of this sign in the absence of a glioma, which labels the condition as one of pseudo-glioma.

Wolff (1951) gives a list of six conditions which come under this heading:—

1. The results of infantile metastatic ophthalmitis.
2. Tuberculous and syphilitic granulation tissue arising from the pars plana of the ciliary body.
3. Exudative retinitis of Coates.
4. Persistence of the posterior sheath of the lens.
5. Retro-lental fibroplasia.
6. Simple detachment of the retina.

The description by Terry (1942) of the syndrome of retro-lental fibroplasia led to a revival of interest in the pathology of “pseudo-glioma,” and the investigations made by many different observers since the publication of Terry’s original paper indicate that some light may at last illuminate this dark corner of ophthalmology.

Reverting to Wolff’s list, which differs in no essential detail from that given by many other writers, it is usually assumed that the under-lying cause is an inflammation and the most likely site is the uveal tract, the involvement of the retina being secondary. In the literature of the pathology of the eye, there is little reference to retinitis. Wolff’s description (1951) of *retinitis proliferans* in the chapter headed “Diseases of

the Vitreous” is an indication surely of the pathologist’s belief that the retina is a membrane little subject to inflammation.

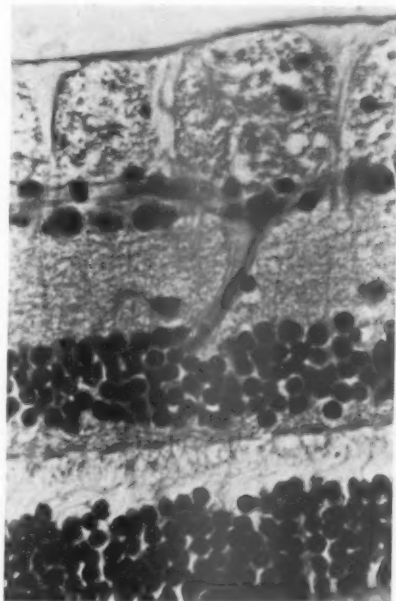


FIG. 1. Radial vessel connecting the capillary networks in the ganglion-cell and bi-polar cell layers of the retina.

Histological examination of inflamed globes indicates that the retina is commonly involved. It is usually assumed that the role of the retina is secondary to that of the uveal tract. Because of its peculiar structure, the signs of inflammation of the retina are not easy to decipher, particularly if the sections are stained only with haematoxylin and eosin. The routine use of Van Gieson’s and Mallory’s connective tissue stains reveals much that is otherwise hidden and

\*Read at the Annual General Meeting, Sydney, June, 1951.

indicates that the main lesion in the fundus in many cases of "pseudo-glioma" is a retinitis. This is often allied with a cyclitis and iritis, the evidences of which are obvious.

The manifestations of retinitis are governed by the anatomical structure of the retina and by its relation to the surrounding structures. The retina covers the whole of the inner surface of the eye-ball, from the margin of the pupil to the optic disc. It is derived from the two epithelial layers at the optic cup, and this distinction remains throughout life. The outer layer, with the exception of that part lining the posterior surface of the iris, which has been partly transformed into the dilator muscle, retains, on the whole, its primitive character. Posterior to the ora-serrata, the inner layer has differentiated into the three nuclear layers of the retina, and has been invaded by a vascular system radiating from the optic disc.

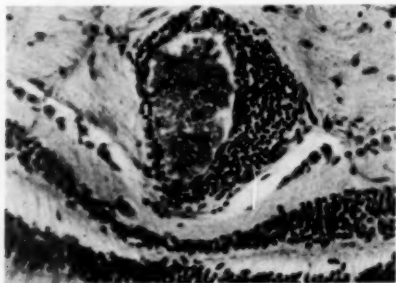


FIG. II. Retinal vein sheathed with perivascular exudate. There is no evidence of exudation from the retinal capillaries nearby.

The three nuclear layers are firmly held together by the fibrils of Müller. In the greater part of the retina, the fibrils run in a radial direction. Their inner foot-pieces unite to form the internal limiting membrane, and the outer similarly form the outer limiting membrane which is fenestrated to allow the outer extremities of the visual cells to pass through. The scaffolding supplied by the fibrils of Müller is quite strong, and binds the retina firmly together. There are two weak areas; one at the optic disc where the fibrils are absent, the other at the fovea where the retinal elements

lying between the two limiting membranes have been pushed aside and are reduced to a few nuclei of the cones with the external limiting membrane almost touching the internal. As a result of this, in the foveal and peri-foveal areas the fibrils of Müller run in a direction almost tangential to the limiting membranes. They can no longer resist any forces tending to push the membranes apart, and this lack of a firm support may be the reason why the central area is prone to oedema. The circular shape which it so often assumes, suggests that the edge of the swelling is in the region where the fibrils once again assume their radial posture. The limiting of papilloedema to the disc itself is also to be explained by the absence of Müller's fibrils.

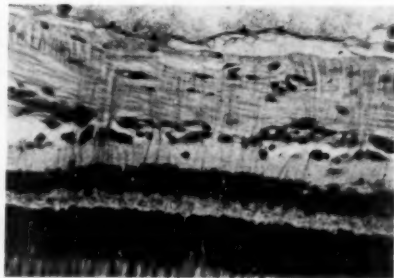


FIG. III. Fibroblasts lying on the internal limiting membrane.

The vascular supply of the retina possesses several unique features which must influence the course of inflammation. The arteries and veins lie in the outer layers only. Whilst the arteries diminish in calibre from the disc to the periphery, and the veins increase from the periphery to the disc, there is no evidence of gradual diminution in calibre from the artery to the capillary. The capillaries branch directly from the larger vessels, and nourish the retina in a series of tangential networks connected by radial capillaries. Throughout the greater part of the retina, there are two networks, one lying in the nerve fibre layer, and one in the layer of bi-polar nuclei (Fig. I). In the central area, and in the vicinity of the disc, this is increased to three or four, and reduced to one near the ora-serrata. As the capillaries do not penetrate any more deeply than the nuclei of the bi-polar cells, there are none

to be found in the centre of the fovea where the bi-polars have been swept aside. It is unfortunate that this should be so, as the nutrition of the fovea is of such vital importance. The call on the capillary circulation is here greater than normal because of the length of the visual cells at the macula, and because of the presence of the thick Henle's layer into which the vessels do not penetrate. The weakness of the peripheral circulation is demonstrated by the constant presence of cystic spaces in the retina near the ora-serrata.

Examination of sections of globes in which inflammation is proceeding simultaneously in the uveal tract and the retina, reveals a difference in the character of the inflammation in these two layers. In the uvea, the process is the usual one of dilation of the capillaries, and exudation from them. There is no evidence that this occurs in the retina. The exudate comes entirely from the larger vessels which are surrounded by collections of round cells not to be found in the depths of the retina (Fig. II). These peri-vascular exudates are separated from the vitreous

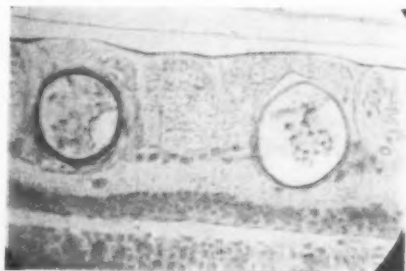


FIG. IV. (Top left): Normal retinal artery and vein in the central area. The diameter of the artery is  $\times 90\mu$  approximately. Mallory's connective tissue stain.



FIG. VI. (Bottom left): Organization and ossification of a sub-retinal exudate in angiomatosis of the retina (Von Hippel). Mallory's connective tissue stain.

The retinal arteries are remarkable for the thinness of their walls (Fig. IV). No elastic lamina can be demonstrated, and it is doubtful whether there is any muscle present in the middle coat. The walls of arteries and veins are very similar, and consist of an inner endothelial layer lining a connective tissue tube.



FIG. V. (Top right): New vessels on the surface of the retina. Mallory's connective tissue stain.



FIG. VII. (Bottom right): Retinitis proliferans and cystic degeneration of the retina in angiomatosis of the retina (Von Hippel). Mallory's connective tissue stain.

only by the internal limiting membrane which is normally thinned out where it passes over the vessels. Should the exudate pass through the membrane, it may creep over the inner surface of the retina (Fig. III), underneath the hyaloid membrane of the vitreous where it organizes and can be demonstrated with the ophthalmoscope as well as histologically. In the vicinity of

the disc it may spread up Cloquet's canal. If the barrier of the hyaloid membrane is passed, perhaps by haemorrhage from a vessel, the exudate spreads into the vitreous cavity with subsequent organization and vascularization — *retinitis proliferans* (Fig. V). Occasionally the hyaloid membrane is detached by the exudate, and may be seen with the ophthalmoscope floating in front of the disc.

It is significant that in panophthalmitis the cellular exudate from the retina is greatest in the region of the disc. That from the rest of the retina is small in amount until the ciliary body is reached. This would indicate that the exudate comes mainly from the large vessels, and is greatest where they are most thickly congregated, that is, in the region of the disc.

In the retina itself, the embarrassment to the circulation results in atrophy of the cellular elements and the formation of cysts. The cells swell, disintegrate, and coalesce to form cystic spaces (Fig. VII). There is comparatively little evidence of fibrosis around the capillaries even after a lifetime of inflammation. Although the rods and cones disappear, the greater part of the glial tissue of the retina appears to be remarkably resistant and never completely disappears.

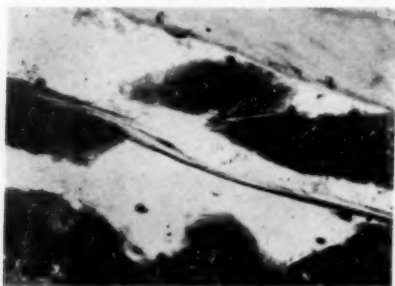


FIG. VIII. Fibroblast lying along the suspensory ligament of the lens.

Exudation eventually occurs into the so-called sub-retinal space between the visual cells and the pigment epithelium, with detachment of the retina. The pigment epithelium becomes active, proliferates and wanders into the retina, probably through the holes left by the atrophic rods and cones, and may finally occupy the spaces round

the arteries and veins. In long standing cases, the sub-retinal exudate organizes, calcifies and ossifies (Fig. VI).

With the ophthalmoscope, the engorgement of the blood vessels and the *retinitis proliferans* are obvious enough. The cysts may appear as intra-retinal exudates, or as semi-transparent spaces with delicate walls. The sub-retinal exudate may be seen as the large opaque white masses of Coates' disease. There is nothing in this syndrome which does not fit in with the picture of chronic retinitis. The identity of the large cells characteristic of the condition is obscure. They may be degenerating retinal cells, macrophages or cells migrating from the retinal pigment epithelium.

The retina anterior to the ora-serrata takes an active part in inflammation of the ciliary body and iris. Here the capillary vessels of the uveal tract are separated from the vitreous only by a double layer of epithelium. Exudates readily pass through this thin barrier, and it is here that in panophthalmitis the largest collection of inflammatory cells is found. In chronic inflammation, fibroblasts find a scaffolding already to hand in the fibres of the suspensory ligament of the lens, along which they creep and gradually build up a cyclitic membrane

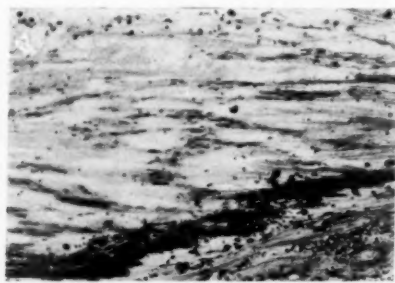


FIG. IX. Proliferation of the ciliary epithelium in the formation of a cyclitic membrane.

(Fig. VIII). The cells of the ciliary epithelium proliferate and spread inwards as pigmented tubes (Fig. IX). In addition, as the cyclitic membrane contracts, it pulls the ciliary processes inwards into the retro-lental space where they may be visible to the ophthalmoscope as long as the lens remains clear.



The purpose of this brief description of the changes occurring in retinitis and cyclitis is to endeavour to find some common feature in the pathological and clinical features of such widely different diseases as angiomas of retinae, Coates' disease, pseudo-glioma and retro-lental fibroplasia. Many observers have noticed the similarity between Coates' disease and angiomas of retinae, and, indeed, it has been hinted that they are the same disease. *Retinitis proliferans*, retinal cysts and exudate, and massive sub-retinal exudation are common to both. There is little doubt that the picture of angiomas of retinae is due to circulatory embarrassment leading to exudation on the surface of the retina with *retinitis proliferans*, to the starvation of the retina with the formation of cysts and to sub-retinal exudation with detachment. There is a similar picture in the so-called juvenile form of Coates' disease, although this has all the hallmarks of an inflammation. There are cases of pseudo-glioma in which the pathological changes are confined to the ciliary region. There is no need to postulate a developmental origin. The histological picture is one of inflammation. In retro-lental fibroplasia the process involves the whole inner coat of the eye and a retinitis is added to the cyclitis. The congestion of the retinal vessels, the formation of retinal cysts and exudates, and the sub-retinal exudation with a detachment which exceeds its usual limits to such an extent that the two layers of the ciliary epithelium may be split asunder—these are all evidence of retinitis. In an adult eye, inflammatory cysts (Fig. X) splitting these two layers are common, and at times a detachment will involve the ciliary epithelium. In the foetal eye, fission of these two layers only recently united will occur more readily than in the adult. The pathological changes occurring behind the lens are those usually associated with a chronic cyclitis—the formation of a cyclitic membrane with proliferation of the ciliary epithelium. (At seven months the hyaloid system is still present and may play some part in the proliferative processes in the fundus behind the lens.) As the fibrous tissue in the cyclitic membrane contracts, it pulls the

ciliary processes inwards towards the centre of the retro-lental space where they are easily seen as pigmented masses. The changes in the lens are secondary to this.

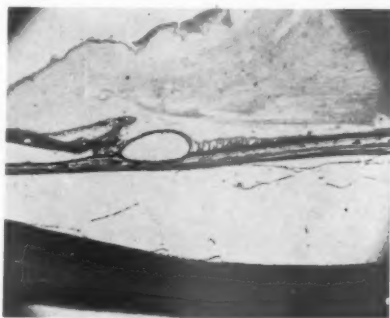


FIG. X. Cyst of the ciliary epithelium at the ora-serrata.

#### SUMMARY.

The clinical features of many apparently widely differing syndromes may be explained on common grounds. It is not suggested that they have a common cause. The vascular malformation of the retina present in Von Hippel's disease is responsible for changes in the fundus which resembles those seen in Coates' disease. In early childhood they lead to the so-called infantile form of that disease and, in infancy, to one of the forms of pseudo-glioma.

When the inflammation involves the ciliary body and iris, the picture of a chronic cyclitis with the formation of a membrane, and its harmful effect on the lens, is super-added. This is the picture which is seen to appear in the premature infant born with a normal fundus and which gradually develops a "retro-lental fibroplasia." Retro-lental fibroplasia is a retinitis associated with an irido-cyclitis occurring in the immature eye.

#### ACKNOWLEDGEMENTS.

I would like to thank Dr. Andrew Brenan, Director of the Pathological Department at St. Vincent's Hospital, Melbourne, for making the facilities available for carrying out this investigation.

I would also like to thank Miss Thornton for her help with the sections and Mr. E. Matthei of the Faculty Workshops at the University of Melbourne for his help with the photomicrographs.

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## THE ARCHIBALD WATSON MEMORIAL LECTURE.

### A BACKGROUND TO MEDICAL PRACTICE AND THE TRAINING OF SURGICAL APPRENTICES AND PUPILS IN VAN DIEMENS LAND.

By W. E. L. H. CROWTHER.

Hobart.

"I have been faithful to thee . . . in my fashion."

—E. Dowson.

THE honour of the invitation to deliver this, the third, Archibald Watson Memorial Lecture, has been very much appreciated and the responsibility of its presentation is much lessened by my predecessors Sir Henry Newland and Professor J. B. Cleland. Each had known the man we commemorate intimately and had had continued association with him. They were therefore in the position to appreciate and place on record, his singular personality and far reaching services to Surgery and Science. My own life touched his at only one point when in the spring of 1916 following the evacuation of Gallipoli my promotion to field rank became effective, as *vice* Major J. A. Watson, Pathologist No. 1 A.G.H. After reporting to the Hospital at Heliopolis and being posted to general duties, I was in company with him for the few days before his return to Australia; long enough to wonder at the man and his conversation and to feel the quality of his character. To have done so was my good fortune and causes the invitation of the College to be the more valued.

Let us turn our attention to Hobart Town in the late twenties and thirties of last century. The small community seething with life and unrest and with the urge to consolidate and expand. The Administration concentrating its efforts to develop the Colony essentially as a Penal Settlement; and a small group of free settlers and emancipists, editors, merchants and professional men opposing this with all their resources and in some instances suffering fines, imprisonment and confiscation as a result. During these years the ship-owners and sailors built and manned schooners, brigs and barques to take the black whale and seals; founding in their pursuit, semi-permanent stations on the Islands of Bass Strait, the shores of King Georges Sound, Australia Felix, New Zealand and South Australia. Macquarie Island was also

visited and Captain Steen sailed his tiny schooner the *Emma Kemp* to Rio, filled her with coffee and returned by way of the Cape of Good Hope, the first native youth to encompass the Globe in his own ship. The same spirit led two expeditions to Port Philip, to found what is now Victoria, as an extension of Van Diemens Land. All these activities were matched with an intense literary and cultural development. Eight newspapers in Hobart Town alone, two literary magazines of high quality, pamphlets political and general, and even a novel in three volumes, the first in Australia. The efforts of our own profession under such circumstances to provide medical training for their pupils are not without interest. Again perhaps the realization, that on 28th of January of this year, his family completed a century and a quarter of practice in Tasmania, may excuse the narrator if he seems to stress overmuch the part played by one of them.

It may be claimed, nevertheless, that the theme of this address, the zest of the actors and their environment too, would have made a strong appeal to the man we remember to-night.

#### A BACKGROUND TO PRACTICE IN VAN DIEMENS LAND.

Among the passengers of the ship *Cumberland*, Captain Carns, which arrived at Hobart Town on 28th Jan., 1825, were William Crowther, Surgeon, his wife Sarah and their children Elizabeth and William Lodewyk aged ten and eight respectively. He was the fourth son of Philip Wyatt Crowther, Comptroller to the Guildhall, London, who had died in 1804 leaving eleven sons and three daughters. Three of the former were commissioned in the Army, two entered the service of the Honorable East India Company

and one each the Church, Law and Medicine. William Crowther had a substantial property near Stockport, Cheshire, adjacent to that of his uncle, before coming to London to study for his profession. After an association with Dr. Cozens of Islington he entered the Combined Hospitals (St. Thomas' and Guys), where his path touched that of two immortals, John Keats the apothecary poet, who was in the class of the previous year, and Thomas Addison, pioneer of endocrinology who entered as a student with himself. When granted his Diploma of M.R.C.S. on 6th Feb., 1819, he was in his late twenties, married and with two children. A period in the West Indies appears to have followed as his address on a

fire whilst at sea. As happens on such long voyages bitter quarrels took place between Crowther and other cabin passengers in which the Captain and Mr. Raine, the charterer, took part. By the action of the Consul General at Rio these appeared to have been composed but after leaving Brazil matters became worse and culminated in Captain Carns violently assaulting his Surgeon. The long voyage ended and the passengers were landed at Hobart Town from the ship's boats on a sandy beach just below where the Museum now stands.

The family stayed at the Macquarie Hotel and Mr. Crowther made his official calls and others on the Rev. Robert Knopwood and Andrew Bent, editor of the *Hobart Town Gazette*. An advertisement in its next number announced his intention to commence practice in the town and that his Diplomas and Testimonials had been left with the editor where they might be inspected. On 31st Dec., 1824, the inhabitants of Van Diemens Land were 22,643 in number including less than 3,000 women. Although free settlers had been arriving for some years the overwhelming majority of the population had been transported. The Government medical establishment consisted of eleven Colonial Surgeons including James Scott the Principal Medical Officer. Two private practitioners, one described as an apothecary the other as a man-midwife, were at Hobart Town. Lt.-Colonel George Arthur had recently succeeded Colonel Sorell and already it was evident that his mild and humane administration had given place to Arthur's consistent policy of developing the Colony essentially as a Penal Establishment with free colonists tolerated only so far as they furthered this purpose. By this time control of public and in many instances private affairs was the prerogative of The Administration and what had been a free press was about to be ruthlessly curbed and suppressed. The Supreme Court, recently constituted, made no provision for trial by jury as understood in the United Kingdom and in effect Government Officials with a favoured number of land owners stood ranged against the general body of free settlers and emancipists. The official party thus enjoyed a monopoly of social privilege, position and power. All too soon, Crowther was to find with which group his fortunes were to be aligned. He may have hoped that



FIG. 1. William Crowther.

certificate of the National Vaccine Establishment of 7th Oct., 1819, is given as St. Domingo. This gave place to practice at Islington as shown by a circular letter of 6th Feb., 1821. In this "he begs leave to present his respectful compliments to the resident families" and to inform them that "acting on the advice of several friends of his late father", he intends to follow his profession in that neighbourhood. The venture did not succeed and the bold decision was made to emigrate to Van Diemens Land.

The *Cumberland* left Plymouth on 28th Aug., 1824, and arrived at Rio de Janeiro two months later having suffered damage from

the last had been heard of the dissensions on the *Cumberland* but immediately after the arrival of the ship, controversial letters appeared in the press and then recourse was had to the law. It is not easy to write of this phase of his career. The descendants of his opponent in three actions before the Supreme Court have been valued and, in two instances, intimate friends of my own and for that reason the names of the plaintiffs are not mentioned. Again in spite of family loyalty Crowther's actions are hard to defend. He had, as will be seen, the defects of his time and no doubt his conduct was conditioned by hard drinking, isolation, anger and frustration. It is necessary however to mention these factors as they explain in part much that will follow. His first action, against Captain Carns, was reported in the *Gazette* of the 22nd April, 1825. It was shown that the latter had in a violent assault forced him from the poop on to the main deck "to his most imminent danger"; and that Mr. Raine, the charterer, had had to intervene on his behalf. A verdict was given for the plaintiff amounting to forty shillings damages and costs. A second action for assault in which Crowther was defendant, had a very different sequel. The plaintiff, a lawyer, was of a family notable for their services to the Colonial Office and with very influential letters of introduction. He was to attain a high legal office in Van Diemens Land and eventually the highest distinction in New South Wales. Acting as his own attorney and counsel, a verdict was given in his favour with damages assessed at fifty pounds and costs amounting to £180. 2. 0. By this time Bent had been dispossessed of his *Gazette* and his new paper the *Colonial Times* (30th Sept., 1825) seized the opportunity to attack the administration. A scathing editorial finishes in this manner: "Look at the Bill, Tasmanians, Look at the Bill, and avoid the Law Courts, if you are able, as you would the Devil." Bent had reason to comment, as only a few weeks before he had suffered heavy fines, three months' imprisonment and the loss of his valuable paper as a result of a reference in its columns to the Lt.-Governor as "a Gideonite of Tyranny."

Mr. Raine was not overlooked and in his turn fined £50 for not supplying a proper table to the cabin passengers. So finished the second of what the legal plaintiff termed two "spirited actions."

Some weeks later Mr. Crowther made application to the Court in reference to the costs awarded against him, was given some slight redress and no more was heard of the matter in the press. The effects of the litigation however were far-reaching. Gone were his high hopes of official favour and support, with no possibility of even an appointment as an Assistant Colonial Surgeon. Much of his limited capital, on which would have been based the extent of his grant of land and which would have afforded the means of stocking it, had gone too. Humiliated and with a burning sense of the injustice he considered he had suffered, he then and there ranged himself with the anti-Arthur faction and commenced practice in the little town. In the daily press from time to time appeared reports of inquests, accidents, illnesses and epidemics in which he was concerned; these have been given in some detail elsewhere (Crowther, 1935). Even the debt to Mr. Raine could not be met by Mr. Crowther and within two years of landing a writ of execution on his effects was issued. An advertisement gives in detail the impending disposal of these, even to a gold-mounted gun by Nock and his grey horse with its saddle and bridle. Somehow this crisis was overcome and he kept doggedly to his work among the humbler portion of the community with frequent visits to patients in the country as far as the Hollow Tree where he had developed a small farm on his location. It is noteworthy that all these references and advertisements appeared only in the journals and almanacks of Andrew Bent and his successor Henry Melville. They had much in common with Crowther as all three had appeared before the Supreme Court, only to lose their cause and be fined with ruthless severity. Bent's allusion to Colonel Arthur cost him £300 in fines as well as three months in the Hobart Town Gaol; while Melville who took over his *Colonial Times* was also imprisoned there in 1835 for contempt of court. Whilst in gaol he compiled a *History of Van Diemens Land* as well as other writings. For some years the publications of these editors were the principal instruments in the struggle for a free press and trial by jury and Crowther associated himself very closely with them. Others concerned in the intellectual and moral struggle to achieve these essential liberties were the Gellibrands, father and son, R. Lathrop Murray and Henry

Savery. This group with E. H. Thomas and Dr. Thomas Richards are considered by Professor Morris Miller to have rendered incomparable service in the political and literary development of Australia. Another extraordinary character comes into the narrative at this stage, the Chevalier Peter Dillon. He was commander of the Honorable East India Company's Ship *Research*, engaged on the first stage of the voyage that was to reveal the fate of the long lost expedition of La Perouse. He had put into the Derwent owing to difficulties with his Surgeon and Scientist, Dr. Tytler, who brought an action against him for assault. Incredible as it seems, the commander of this important venture, after long delay, was sentenced by the Supreme Court to two months' imprisonment as well as the customary fifty pounds fine. However part of the sentence was remitted and the voyage resumed. At Mallicolo and Tucopia, he learned from the natives of the casting on shore of the two vessels of La Perouse, some forty years before and the subsequent fate of the survivors. He also recovered from them many relics of the expedition. These Dillon, in due course, presented to the King of France who, in recognition of his services, granted him a pension and the title of Chevalier. During the long stay at Hobart Town Captain Dillon must have discussed his experiences with Crowther and his narrative (Dillon, 1829) mentions the affray on the *Cumberland* in some detail. His remarks leave no doubt of a common sympathy in their experiences and the decisions of the Supreme Court.

Another with whom his lines were cast was Henry Savery, one time merchant of Bristol, transported for forgery in 1829 and supposed author of *The Hermit in Van Diemens Land*. On 5th June, 1829, there appeared in the *Colonial Times* the first of a series of articles under this title and the cognomen Simon Stukely. Each week readers were given an extremely ably written column or more in which well known officials and settlers were mercilessly exposed and derided. The names of course were supposititious but the identity of those described was only too clearly indicated. These lampoons continued until the end of the year to the delight of the man in the street and bitter anger of many of those depicted. In 1830 the series appeared in a pamphlet (Savery, 1829), now one of the rarest and most interesting of Bent's pub-

lications. Even today there is uncertainty as to the author but he is believed to have been Savery who at the time had a ticket of leave and was employed by Melville at the *Colonial Times*. He went on to write the first Australian novel *Quintus Servington*, failed as an agriculturist, again committed forgery and whilst at Port Arthur, took his life.

Well, here is Mr. Crowther as seen by the Hermit in the issues of 28th Aug., and 30th Oct., 1829. Although by no means flattering they do convey a real impression of the man, his associates, and the Hobart Town of the period. The first opens with the Hermit riding up Elizabeth Street, by the Dallas Arms (still standing) and being overtaken by a horseman whom he recognizes as an acquaintance (Mr. Crowther); who greets him with "*Bon jour, Monsieur, which way are you bound?*" The civility being returned, they jog along together in friendly chit chat.

The Hermit or rather Simon continues:—

"I had never seen him before on horseback, but had frequently noted his extraordinary height and carriage as a pedestrian and now mounted on a hack he appeared like a moving tower; his two legs swinging backwards and forwards, resembling the pendulum of a clock in rapid motion."

The conversation as they rode touched on the medical profession, "*the Ars Medica et Chirurgica*" and a new arrival "*Dr. Gallipot*." At their destination, a public house, after turning in through a gate and handing the horses to a servant they went inside. The surgeon having left the room to examine his patient; "*mine Host*" a thin middle-aged man entered and after placing two glasses of spirits on the table engaged Simon in conversation:—

"The Doctor's a wonderful man, Sir, he knows a matter of thirteen languages and 'twould most make your hair stand on end, if you were to hear him as I have, when he is a little gone in the wind as the saying is, Lord, Sir, he raps out foreign lingo so, just for all the world like a Frenchman."

Being asked how he knew what he looked like in such circumstances, the landlord continued,

"Oh, Sir, he and a friend of his are pretty nearly the best customers some in our line have, and they both talk in the same way like and I've heard said, they are the two best scholars in these parts."

The person under discussion now re-entered the room and "*systematically as it were*" emptied one of the glasses, before receiving a messenger come express from



town requiring his immediate attendance on a case of emergency. Some weeks were to pass before Simon Stukely again met "the tall son of Aesculapius", this time in a lawyer's office. He soliloquizes on his character in this manner:—

"Bateing one or two little drawbacks (he is) a man formed to be a general favourite but like most of us his good qualities are sometimes so veiled by certain propensities . . . that his real professional skill and naturally friendly disposition, are not in the eyes of some considered sufficient counterpoise to his inclination to good fellowship and the exhilarating glass which must of necessity be gratified even at the expense now and then, of a descent in the scale of moral society. In very truth, I believe I was now in the company of much that was well bred, well educated, well disposed, clever and accomplished on both sides, but if one was the particular friend, so I apprehend, the other was a first cousin of that renowned three bottle Knight, Sir John, and each is, I am told, a worthy disciple of so celebrated a master."

After the refreshment, the trio (the third member being a Mr. Harris?), set out to interview a legal practitioner to whom, the surgeon was in debt and obviously not welcome. The attorney had been mercilessly used in a recent effusion of Simon Stukely's and had persuaded himself that Mr. Crowther was the actual writer of the article. In the interview that followed he is described as:—

"Grasping the back of a chair . . . and as if he had mastered some violent internal emotion, crying out in a voice half choked with rage and anger . . . How dare you put your feet inside my door, Sir, *You are the Hermit . . . You are Sir.*"

The remainder of this very unpleasant interview is given in some detail and on leaving, the party were inclined to congratulate themselves by the reflection:—

"The modest blister they had applied could not have been so effective, had it not been put on a raw place."

A few months later, the attorney had his redress when the proprietor of the *Colonial Times* was found guilty of publishing the article and heavily fined. Mr. Crowther was called as a witness at the trial, where it was alleged by the plaintiff that it was he who was the actual author of the libel contained in the 17th instalment of the *Hermit*. The Court may have taken into consideration that the Surgeon had himself suffered in the same manner at the hands of the *Hermit*.

Enough has been said of these phases of his early years at Hobart Town, to explain in part at least, the incidents on the *Cumberland*

and what the local press termed "a fracas in high life" when on an October night of 1826, in Collins Street, he and Captain H. B. Thomas were at variance. After all, such things did occur in the days of the Regency; and there were other aspects of his character to offset these lapses.

Fundamentally he was deeply religious and a staunch Anglican and had no lack of support in his personal relationships. Perhaps the most constant was the Rev. Robert Knopwood who had come to the Colony with Colonel Collins in 1803 and who had a very similar attitude towards life. Crowther is mentioned by Knopwood both as medical advisor and intimate friend, on many occasions in the historic diary; which remains the most valuable chronicle of the first four decades of the settlement at the Derwent. Thus it records (13th March, 1831);

"Dr. Crowther called and took wine in the Eve returning and stayed the night and went back the next day"

and three weeks later,

"Dr. Crowther came in from Mr. Evans and stayed all night."

They certainly had much in common and congenial in spirit, anticipated the dictum of Jorrocks "where I dines I sleeps." Mr. Knopwood by this time had handed over his duties as Senior Chaplain, and was living at his cottage at Clarence Plains near Rokeby Church where he now lies buried. From time to time other entries tell of his own health, as when on 14th April, 1831

"so ill obliged to send for Dr. Crowther, who came and gave me medicine the fever a little abated."

The improvement was not maintained and two days later he writes "Sent for Dr. Crowther and was bled he stayed all night." It was the habit of his friend to break his journey at the cottage as he rode to and from patients in the neighbouring district; so such items occur as "Dr. Crowther breakfasted with me on his way to Muddy plains to see Mrs. Bushby." His services were soon again required for "Old Bobby" as he was affectionately known when he had another fall from his equally well known Timor pony. Mr. Bushby the diary records "went to Hobart for Dr. Crowther they returned the same eve. The Doctor bled me he stayed on." Their friendship founded on mutual regard and

Mon 25 This morn rode to Muddy Plains called the school  
 Examined the children, called on Mr Murray  
 going across the plain in a gallop the Poney fell  
 I received a very severe shock having met my head  
 neck and shoulder with the bric-a-brac. Mr  
 Busby they took every care of me & did all that  
 was with very great difficulty got me back to the house  
 26 The Poney and rode home. Went to the station  
 got to Crowther, they returned the same evening  
 in bed the 28th m. Dr. M. Busby & Dr. A. and Dr. J.  
 Dr. Busby returned home & Dr. S. & Dr. H. Dr. J. & Dr. S.  
 called upon me - and Dr. S. & Dr. H. had very bad  
 terribly bruised, no sleep and unable to move except  
 Mrs. M. & Mr. H. called upon me, and many English &  
 suffering much from pain  
 27 Harriet had some sleep during the night and  
 Pottel Mrs. S. & Dr. H. & Dr. J. & Dr. S. & Dr. H.  
 28 Fairly better in the morn. Mrs. S. & Dr. H. & Dr. J. & Dr. S.  
 30 See me from the boat when they could not see me  
 still suffering much from pain.

FIG. II. A page from the diary of Rev. R. Knopwood with references to Crowther.

intensified by a detestation of the Arthur administration and their common experience in relation to their land grants, only terminated with the death of the old clergyman on 18th Sept., 1838. The outstanding historian of the Roman Catholic Church in Tasmania, my friend Monseigneur J. Cullen, has told me of papers in the archives of his church, since destroyed, showing a close relationship between Father Philip Conolly, their first priest, and Crowther. These related to the condition of such patients as required his spiritual ministrations. Again among my books is one given my forebear by the Rev. Benjamin Carvosso, the first Methodist Minister in Van Diemens Land. Another bears this inscription "To Dr. Crowther as a trifling acknowledgement of his kind and unremitting attention to Frederick Miller, Nov. 17, 1834." The donor was the first Congregational Clergyman in the Colony and a man of wide charity and culture.

Thus better times came with the passing of the first crucial years. The plans for a practice among those whom the Hermit had styled the "withins" had had to give place to the very different work among the humbler, but surely far more interesting, "withouts", and slowly the turbulent and aggressive period of his activities shaded into the settled and happier years of his last decade. There is no space here to touch on his land grants in which he was associated with the able Joseph Tice Gellibrand, first in the field in relation to the settlement of Port Phillip from Van Diemens Land, and soon to lose his life in its exploration. The same personal relationship occurred in the political struggles of the Colony, and I have his copy of the very rare report of the meeting of the "Public Meeting of the Colonists" of 2nd Aug., 1834, the third and largest of those demanding trial by jury. In this Crowther was not allotted an active part in its list of speakers. His turn was to come when at the next meeting of 28th Feb., 1834, Mr. Robert Lathrop Murray proposed and Mr. Crowther seconded the fourth resolution. In this His Majesty was thanked for what had been done in the granting of redress in relation to trial by Jury and after recounting the demoralization and hardships endured by the free members of the community continued.

"Your Majesty's humble petitioners most respectfully pray of Your Majesty, to be pleased in your paternal goodness, to remove from the Colony of

Van Diemens Land the degradation and other unspeakable evils to which it is subjected in consequence of its present penal character."

The motion was carried with three dissentients. Murray, reputedly of royal birth and formerly in the Army, had been transported for an offence against the Marriage Act. At one time an implacable opponent of the Administration he later became its supporter. The Resolution itself, may be regarded as the first shot in the movement for the cessation of Transportation.

Having considered all these factors it is time to turn to what Crowther was able to do for education in the community and more particularly those entering his own profession.

#### MR. WILLIAM CROWTHER, JAMES SCOTT, M.D., AND THE TRAINING OF MEDICAL PUPILS AT H.M. COLONIAL HOSPITAL.

Unhappily, few of my great grandfather's books and papers remain. In a pocket pharmacopoeia he has written how with a number of other valuable volumes and documents, it was damaged or destroyed when a large sea flooded the cabin off the coast of Van Diemens Land. Those that remain include some text books, one on medicine interleaved with notes, a letter book with more than half its pages cut out and the manuscript of four lectures on education and geology. The few volumes of a general nature indicate his inclination to the classics and humanities. There are no personal papers or journals relating to his daily routine or conduct of practice.

The following advertisement appeared in the *Hobart Town Gazette* of 18th Nov., 1826:

"Wanted a respectable youth as an apprentice. He will have the advantage of an extensive practice and will be treated in every respect as one of the family. A moderate premium only required, his assistance being the chief object. For particulars apply to Mr. Crowther, Surgeon."

The period of service is not stated, but the first of five large folio volumes of Lavater on Physiognomy, still in my possession, bears this inscription:

"The gift of an affectionate Father and Mother to their only son, William Lodewyk Crowther, as a trifle of merit, well earned during his six years of surgical apprenticeship. V.D. Land. Feb. 22, 1839."

His service would have probably been of longer duration than that of others. There is indirect evidence that a Mr. Harrington was the first pupil and a family tradition that he was followed by John Pearson Rowe. Both were later associated with the Hobart Town Dispensary, founded by their principal in 1833. This Institution, to which Mr. Rowe was Hon. Secretary in 1834, the forerunner of Friendly Societies in Tasmania, had opened with 150 subscribers and nearly 200 members, with the Clergy of the Town as Honorary Governors. Mr. Rowe in 1843 took up large holdings at Port Phillip and was an original member of the University Council and Committee responsible for the opening of the Melbourne School of Medicine.

The experience of the pupils was obtained from the practice and dispensary as Mr. Crowther had no right of access to H.M. Colonial Hospital, nor were his apprentices allowed to work there. This was a very real deprivation as the cadavers of the indigent and condemned criminals provided an extraordinary opportunity for anatomical and surgical instruction. The need of such facilities became so pressing that on two occasions Mr. Crowther approached the Lt. Governor with a view to the admittance of his students. Once again he was to be frustrated, but the correspondence following the application is of much interest. The control of the Hospital at this time was in the hands of James Scott, M.D., Senior Colonial Surgeon, who, in 1825, had acted as an assessor to the Chief Justice in the case when Mr. Crowther had been so heavily fined for assault. His marriage to Lucy Davey, daughter of a former Lt. Governor, had brought him considerable wealth and increased influence in the community. From his home, *Boa Vista* still regarded as one of our finest colonial mansions, he combined private practice with his official duties and is said to have enjoyed an income of £2,000 per annum, an immense sum at that time. The enmity between these two surgeons is clearly to be seen in the controversy that followed. In the *Hobart Town Courier* of 19th Oct., 1832, was this report of executions that had taken place two days before:

"On Wednesday morning the awful sentence of death was carried into effect on the scaffold at Hobart Town, on Thomas Fleet and William Evans, both convicted of attempts to murder, the former

by striking William Saxton at Port Arthur with an axe, and the latter by stabbing G. S. Edwards with a knife at the new bridge at Heatecombe. They both confessed the enormity of their crime and how richly they deserved their awful fate. Evans had been transported to this Colony from the Cape of Good Hope."

It is of interest as Mr. Crowther, realising the bodies would be handed to the Colonial Hospital for dissection, had a week before petitioned the Lt. Governor in these terms:

Oct. 12, 1832. To H. Excellency, Colonel Arthur.

Sir, I am unwilling to trespass on your time unnecessarily but the interest of the subject to the rising age in diffusing the surgical and medical knowledge which the establishment of the Colonial Hospital affords, induces me to direct your Excellency's consideration to the subject of allowing the pupils of surgeons practising in Hobart Town to attend all surgical operations and dissections of subjects, given over by the laws for that purpose. To prevent any impediment to Your Excellency's granting this request by any personal differences of the Profession with those gentlemen who are appointed to the Medical and Surgical duties of the Colonial Hospital, I beg leave respectfully, Your Excellency, should be appraised it is not my wish to attend, the request being intended for the benefit of the young professional students.

I have, etc. . . . Wm. Crowther.

The Colonial Secretary, on the same day, made this minute:

"Referred for the report of the Colonial Surgeon, to whom the application should have been addressed in the first instance."

Scott's reply, received on the following day, was, as might have been expected:

"It is no part of my duties to educate the pupils of private practitioners. I beg therefore, respectfully, to object to the application being complied with. J. Scott."

The crushing rejoinder of the Lt. Governor, to be communicated by the Colonial Secretary, was as follows:

"It may readily be admitted that it is no part of the 'duty' of the Colonial Surgeon to educate the pupils of private practitioners, but, in the diffusion of knowledge one would scarcely be bound by the rigid obligation of duty and I should hope that the Colonial Surgeon would open the way to a liberal feeling in the profession here which may be important in the results and cannot fail to be gratifying to his own mind . . . on reconsidering the subject, Dr. Scott would perhaps originate some plan which emanating from himself would be more gratifying to those whose benefit it is proposed to promote. G.A. 16 Oct., 1832."

It might well have been assumed that Dr. Scott would have taken advantage of the

opening so gracefully offered by Colonel Arthur, but his reply of 23rd Oct. was uncompromising:

"I have ever followed the most liberal course (in the diffusion of knowledge) and the Hospital and other means I have of obtaining information, are and have been, open to everyone with whom I could properly meet as a professional man, but, that this indulgence has been once and again grossly abused so much so as induce me to be very guarded as to the individuals with whom I associate professionally. The truth is I cannot acknowledge many persons who practice here, as members of the profession or as in any way entitled to the privileges; but I beg leave to say most respectfully, that as soon as a legislative enactment for the protection of the Faculty and the Public is introduced as in the other Colonies, and an efficient Medical Board appointed having the power to proceed against empirics and others who improperly assume the medical character, I shall be disposed to look upon the practitioners and their pupils, in a very different light and to be the first to opening the way to a liberal feeling in the profession."

The comment of that very wise administrator, the Lt. Governor, is illuminating:

"At present I must defer to the opinion of the Colonial Surgeon, who says 'gross abuse' has been the result of indulgence but I must confess I am not at all convinced. G.A."

Mr. Crowther promptly challenged these implications, in the following reply to Colonel Arthur:

"Sir, Having received an official answer to my application of the 12 ult. in which my request is not acceded to in consequence of objections made by Dr. Scott . . . may I request the favour of being made acquainted with them, as the object in view, is too important to all young medical students to remain unobserved. Wm. C."

After a reply couched in general terms another approach was made to the Lt. Governor:

"Sir, I beg respectfully to acknowledge the communication of yesterday detailing that in consequence of gross abuse, during surgical operations and dissections at the Colonial Hospital, Your Excellency has been induced to disallow the means of acquiring medical instruction which that establishment is so exactly calculated to afford the rising youth of the Colony. A prohibition at once so injurious to the interests of science and the cause of humanity, which I would not suppose for a moment Your Excellency would participate in. Permit me to suggest that Your Excellency will be pleased to order an investigation into the abuses set forth in the letter of the 9th inst. and let the parties so offending be alone answerable to their exclusion for that delinquency. . . .

"I have, etc. . . . Wm. Crowther. 10.11.1832."

The reply to this reasonable and moderate request was: "that since this indulgence had been once and again abused very grossly" the Lt. Governor found himself unable to authorise a renewal of the permission. To the Colonial Secretary went the curt instruction, "put off for the present." While the file of correspondence is not complete, it is clear that both Colonel Arthur and Mr. Burnett were favourably disposed to the proposition; and embarrassed by the attitude of their Senior Medical Officer, intended to re-open the matter at a convenient opportunity.

So the first application failed. Drs. Scott and Bedford were too strongly entrenched at the Hospital and closely allied to the Arthur faction to be denied. E. S. P. Bedford, a son of the Senior Chaplain, at this time on the staff of the hospital, was a lifelong friend of Scott, and at his death became his executor. At this time, too, Edmund Charles Hobson, later scientist and pioneer surgeon at Port Phillip, was an apprentice to Scott, and may not have been the only one. Two more years were to pass, however, before the matter was re-opened.

On Friday, 13th June, 1834, Benjamin Davidson, William Murdoch and Henry Street were found guilty of the brutal murder of an elderly lady, Mrs. Howell. All three were assigned servants either at her home in the country or nearby. The evidence showed that after committing the crime, the murderers tied each other firmly with ropes and when discovered stated the actual deed had been done by bushrangers, who by first binding them prevented their aiding the victim. In passing the sentence of guilty for this outrage, the Judge directed that the prisoners be hanged three days later and their bodies dissected and anatomised. Mr. Crowther promptly presented another memorial to the Lt. Governor, stating:

"As an opportunity of public dissections is now about to occur by the approaching execution of three convicted murderers, I beg to refer Your Excellency to my previous correspondence on this subject and to solicit permission for my surgical pupils to attend the dissections of the malefactors in question."

The Colonial Secretary in approaching Colonel Arthur, reminded him of the former occasion in which "Your Excellency had deferred to Mr. Scott's decision though not at all convinced as to the propriety of such



sweeping exclusion" and submitted as his own opinion "I certainly consider it proper and advisable that all medical students should be admitted to dissections. J.B. 14.6.1834." After consideration the Lt. Governor minuted the proposal "It appears to be desirable that some regulations should be drawn up under which medical students might have access to dissections" and instructed that the matter be referred as immediate and urgent to the Colonial Surgeon, to whom the Court had ordered the delivery of the bodies. Dr. Scott, however, had been more than equal to the occasion and was in the strong position of having already dealt with the matter. On 19th June, he was able to make this reply:

"I have the honour to state that on being informed that the bodies of three murderers were ordered by the Court to be delivered over to me for dissection, I gave directions for their reception at the Colonial Hospital and the admission of such people as might be disposed to witness the operations. Several medical gentlemen and private individuals attended. After the dissection to several pupils and medical gentlemen of my acquaintance, demonstrations were given and various operations of surgery shown for the instruction of the young and the satisfaction of the old. I beg leave to state that I have invariably considered it my duty to make a public exhibition of the dissection of criminals as ordered to be delivered to me for that purpose as soon as convenient, on the day of execution. I will continue to do so while I have the honour to be Chief Surgeon of this place and subsequently to use the privilege of making such use of the bodies as is granted by law.

"I beg to add that Mr. Crowther and his pupils have had free access to the public dissections and exhibition but not to be present at any demonstrations on the bodies or operations without my entire free will nor to touch the bodies without my sanction and as to granting indiscriminating admission to persons calling themselves Physicians, Surgeons or Medical Students to witness my practice in the Hospital, I will never give my consent, the idea would be as preposterous as were I demand admission for my son to the office of the Attorney General, the Colonial Architect or Surveyor General to gain for him a knowledge of their professions."

By this time Murdoch, Street and Davidson had expiated their crimes. The latter, the actual murderer, was only twenty-three, and the reporter of the *Hobart Town Courier* obviously affected by his experience, tells of the final scene.

"Extreme terror and paleness marked his countenance, which indeed, from the suddenness with which the final stroke was effected on himself, the jerk of the rope breaking his neck and preventing all flow of blood to the head continued remarkable after death."

Thus the contribution of the three hapless victims to the science of Anatomy at the old Hospital was accomplished and their remains disposed of.

Well, at least something had been gained for the pupils nor did this intemperate letter of Scott's strengthen his position. No further action was taken by the Lt. Governor at the time except to instruct the Colonial Secretary to write for information as to what course is adopted in such cases in Great Britain, and in the meantime defer the final decision. Mr. Burnett, with courage made the comment, "I differ *in toto* from the position taken up by the Colonial Surgeon." The remark was significant. In the following year, Dr. Scott was reduced in status with the appointment of Dr. J. Arthur as Deputy Inspector General and Principal Medical Officer of Hospitals and to control the medical department. His death followed on 21st July, 1837, by which time a new regime had opened. Hobson was now at University College Hospital, and had qualified. Dr. Bedford, who had been appointed to the Colonial Hospital, in a letter to his one time pupil, dated 7th Oct., 1837, gives some interesting details of his work there. He touches first on the death of "poor Scott", of whom he was Executor:

"I regret to have to tell you of a great loss you have sustained in the death of poor Scott, he died on the 21st of July after three weeks' confinement to his bed, from Pyloric Disease, the tumor could be felt and therefore his case was distinct for four months prior!"

He continues:

"With regards to myself, I am now in charge of the Colonial Hospital but there is not any assistant to me. There is no Colonial Surgeon. The boy I operated upon for stone did well and the man for Carotid Aneurism after being at work for a few weeks returned with pulmonic symptoms and died suddenly from bleeding. The artery that had been tied ulcerated into the Aorta. You remember Wheeler, I operated upon him for Popliteal Aneurism two years ago in the Left Leg and returned in 12 months but I got rid of it . . . twelve months after that another Aneurism formed in the Right side and I operated three weeks ago. He is doing well the sac suppurated."

Bedford closed the letter with advice to Mr. Hobson on his returning to Van Diemens Land either to practise or as a scientist (Hobson had come under the teaching and inspiration of Richard Owen and Professor Grant). On 6th Jan., 1837, Sir John and



Lady Franklin arrived at Hobart Town in succession to Colonel Arthur who had been recalled. They were received with delight and commenced the difficult task of administering a government with at best the reluctant co-operation of senior officials all of Arthur's appointment. With the coming of the new Principal Medical Officer two medical Acts were submitted to the Legislative Council (V.R. 14 and 17 of the 25 and 27 Nov. 1837). They provided for the "Attendance of Medical Witnesses" and "To regulate the profession and practice of Medicine in this Island and its dependencies," respectively. Under the second, a Court of Medical Examiners was constituted, before which an applicant was required to produce qualifications obtained in the old world or obtain a Letters Testimonial to be granted by at a minimum of three members of the Court which comprised seven members with Dr. John Arthur as President.

In order to obtain a Letters Testimonial, it was enacted that on and after 1st Jan., 1840, a candidate would have to conform to a prescribed course of education and prior to becoming an apprentice pass an examination which included the Greek and Latin languages. The terms of his apprenticeship also required a certificate from the legally qualified medical practitioner to whom he had been indentured to the effect that he had fully and perfectly served the required five years. In addition he was required to produce such certificates of attendances at Hospitals as the Court might demand. The Act also provided that the principal could only receive as an apprentice, a person not under sixteen years of age who had fulfilled the preliminary educational requirements. Fees to be paid for the Letters and admission to apprenticeship were to be determined by the Court and subject to approval by the Lt. Governor. The last clause, of considerable interest, enacts that all such sums shall be applied, *inter alia*, "towards the support of either an Anatomical Museum or any other Institution for the Advancement of Medical Science."

On the day the Act became law an Address was laid before the Legislative Council by Mr. William Crowther and read by the Clerk, Adam Turnbull, M.D. (*Hobart Town Courier*, 8th Dec., 1837). It expresses warm approval of the terms of the proposed legislation in

its provision for the protection of the public and its guarantee of the respectability and qualifications of the medical practitioners. After this considered introduction, the suggestion is made that a Court of four members and President would provide an adequate tribunal, in view of the fact that the Royal College allotted only two examiners to each pupil and the Society of Apothecaries three. In the appropriation of the funds, that is "fees and fines or rather surplus thereof", he suggests they be devoted to an Anatomical Museum or rather to the establishment of a Colonial School of Medicine, to which such a museum would be an indispensable appendage. Selecting one of the principle objects of the Act, the encouragement of pupils completing their course in Hobart Town, rather than taking the long journey of 16,000 miles for that purpose, he emphasizes that all the requisites for the full and proper study of Anatomy are at hand at the Colonial Hospital. Recalling his own experience of the system of tuition in London and more especially at the large Metropolitan Hospitals, he continues:—

"I must say . . . the advantages to the student in points of actual utility (in London) are not to be considered with those that would accrue from a such managed School here. The student will find . . . in a quiet well arranged school such as our Colonial may and ought to be, more facilities . . . than may at first sight appear possible . . ."

The remainder of the address consists of nine suggestions as to the constitution, functions and administration of the proposed Court. The vision thus placed before the Legislative Council was not to be. Even the limited use of the facilities was withheld for many years until the personnel of the Colonial Medical Administration were succeeded by independent practitioners of ambition and outstanding professional ability.

Among my papers are the manuscript of five lectures, one on education, the others on geology, which Mr. Crowther delivered to members of the Hobart Town Mechanics Institute during the sessions of 1837-8-9. Each is about thirty folio pages in length and bound in its original grey wrappers. They owe their preservation to the tender care of his daughter and her children. The Institute was directed by a Committee with the Lt. Governor as Patron, and the Chief Justice as President. Meetings were held at the reading

rooms, Collins Street, where its excellent Library was housed. The address on Education was well written and comprehensive, and notable for his plea that a new conception of its scope was required in the interests of the rising youth; and the suggestion that instruction in elementary anatomy and allied science should be provided, anticipating the place now filled by biology and similar subjects.

The series on geology covered the usual aspects of the science as then understood with constant reference to the control of a supreme and all wise creator. Stress was laid on the compatibility of religion with all sciences with Galileo, Newton and Kepler instanced as reconciling new hypotheses with their religious beliefs. On the next occasion having informed his audience that the preceding lecture (obviously a very long one), "was little more than the peeling of the orange", he discussed some general considerations of the surface of the earth and its stratifications, showing diagrams and specimens to illustrate his discourse. He made a strong plea for practical field work nearer home, "A tour of the summit of Mount Wellington would," he continued, "furnish an essay far more interesting than any geological definitions . . . there in the grandest order, rise Basaltic columns, etc., etc." He went on to say, "I introduce this interesting subject, that the rising youth . . . should not be mere theorists but advocate and contend . . . from practical experience." Again when describing unstratified rocks he instanced Gunners Quoin, opposite Roseneath, and part of Mount Direction, as illustrating his theory. He showed too "Fossil remains of Vegetation and Sea Shells beautifully deposited" in Limestone from his estate of *Sans Souci* at O'Briens Bridge. Note, he suggests, in the course of the following lecture: the "crystallised specimen of a tree discovered on Mr. Barker's estate at Macquarie Plains, New Norfolk, deposited in a strata of igneous porous rocks, which completely enveloped it. The trunk of the tree, all consisting of the same structure we excavated to the depth of ten feet from the surface of the ground . . . and at its base it was sixteen feet around and I have no doubt extending many feet below. It now stands on geological record as a subterranean irruption of a former age which has required

igneous fission to impose a crystalline texture to the earthy carbonates."

In the following year two more lectures were given, of equal length and concerned with organic fossil remains. On these occasions, the chair long neglected by Colonel Arthur was occupied by Sir John Franklin, who explained in his concluding remarks:

"In my last address to you on the subject of its claims, this excellent institute had to the support and patronage of those, who by their elevation in life (society) could, by giving it their countenance and support, add a dignity and solidity to its first public efforts. Since then, this consummation, so devoutly to be wished, has been conspicuously realized by the highest rank in the Colony, becoming its Patron and a very considerable addition of members of influence and talent. It has now a Minerva like protection extending over it a shield, which augurs a confiding hope that its labours may go on increasing in prosperity and active usefulness."

We may imagine the joy with which he and those who had suffered so long under the Arthur faction would welcome the humane and liberal spirit Sir John and his Lady brought to their many and exacting duties.

My great grandfather may well have thought that a number of years of comparative rest and leisure lay before him; Elizabeth, his daughter, happily married and her first child safely born. George Maddox, his apprenticeship completed, already in England, and his own son at St. Thomas' Hospital, London. The family had moved from Collins Street and were living at his small estate, *Sans Souci*, some five miles from Hobart Town, where, though still in active practice, he could indulge his hobby of raising pheasants (a few years before he had applied for an additional grant of land on the grounds that he had introduced the grey rabbit to Van Diemens Land). It was not to be, however. On a dark night towards the end of 1838 he was called to a patient in the country near Brighton, and on returning his horse stumbled and threw him on a heap of logs and stones in the centre of the road. These had been purposely left to make travellers diverge to a newly formed surface. He sustained severe injuries to his head and face, and after a protracted recovery was able to resume practice only to die on Xmas Day, 1839, in his fifty-first year. He had had no easy journey through life, and the stresses of continued work and controversy

had taken their toll. He would perhaps have asked for no better tribute than his epitaph in St. David's Park, "Not ignorant of evil himself he learned to pity the wretched."

Scott), Bedford's administration of the Hospital was in question when Dr. John Arthur, the new Principal Medical Officer, charged him with "insubordination, deception and



FIG. III. *Sans Souci*, the estate of William Crowther, five miles from Hobart Town.

He had had at least the satisfaction of initiating the training of pupils for his profession in Van Diemens Land, and of having striven to the best of his ability that the facilities for students at the Colonial Hospital should be fully utilized and that all should have equal access to them.

Happily, there was another at hand to take up the work he had been unable to complete.

#### DR. E. S. P. BEDFORD AND HIS HOSPITAL OF ST. MARY'S.

Dr. E. S. P. Bedford to whom reference has already been made was a son of William Bedford, D.D., Senior Chaplain to the Colony. An earlier account of his career (Crowther, 1944) was incorrect in assuming his education and medical tuition had been acquired at Hobart Town. Bedford qualified as a Member of the Royal College of Surgeons of England in 1823 and his association with the Colonial Hospital should not have preceded his appointment as Assistant Colonial Surgeon in 1828. It is certain he took the largest part in the training of Edmund Hobson, and after succeeding Scott in 1837 he refers to a pupil of his own, Tom (?T. D.

interference in hospital matters", but his position was not seriously threatened. In any case the time was ripe for a change as the Colonial Hospital made provision only for the indigent, paupers and members of the system. Bedford, recognizing the want of other accommodation, with the help of influential friends, was, on 1st Jan., 1841, in a position to open his own institution, St. Mary's Hospital. He had adapted a two-storey stone building in Campbell Street,

"as a self supporting hospital, for the benefit of the labouring classes of society, to afford at a small cost, medical attendance for the poor, to enable the rich to assist the destitute sick and at the same time to encourage the working classes in procuring aid at their own expense."

The prospectus continues,

"in the new building there will be separate rooms as a Sanatorium, for the accommodation of persons in the middling classes of society."

The venture was a great success and in seven years the foundation stone of an impressive new building was laid with full ceremony. All went well until in 1859 the Home Government notified the local authorities that from the first day of 1860, the old Colonial Hospital which for some years had been known as H.M. General Hospital, would

cease to function as an establishment for convicts and so be available to the public. As a result, Bedford found himself unable to continue St. Mary's, and it had to be closed. During this period of some 20 years he had trained a number of pupils. In a report Bedford (1859) mentions specifically that since 1833 eight had obtained Diplomas in England. Their names were the late E. C. Hobson (Gold Medallist, London), Dr. John Peet (Principal of Grant's Medical College, Bombay), the late Mr. T. D. Scott (Assistant Surgeon, R.N.), Mr. MacDougall, Mr. G. Garrard (first prize for Anatomy, Kings College, London), Mr. Walter Scott, Mr. Hadden and Mr. Turnley. Dr. Bedford had done much to embody his ambition of

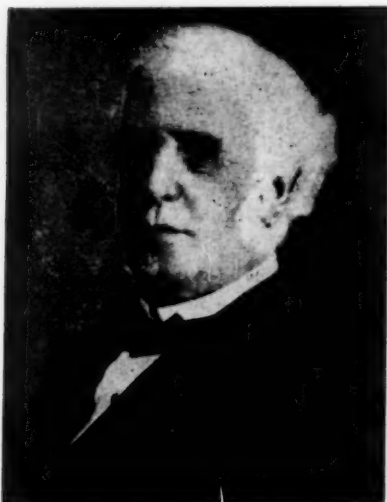


FIG. IV. Dr. E. S. P. Bedford.

a preparatory School of Medicine for the Australian Colonies. His plans for this project with full details of the proposed medical curriculum are given in the address already mentioned. The Lt. Governor, Sir William Denison, the Governor General of New South Wales, Sir Alfred Stephen, the Governor of Victoria, and other influential persons gave their support to the proposals submitted to the Royal College of Surgeons. The suggested course was to be one of three years, its subjects Anatomy and allied science, Greek, Latin, History and English. Dr. Bedford proposed himself as instructor in

Anatomy with a series of not less than 60 lectures or demonstrations in each year with Mr. Thomas Arnold, brother of Matthew Arnold, and son of Arnold of Rugby, to supervise the lectures in the Classics and Humanities. He anticipated an annual intake of 12 students from the Australian Colonies who would have access to a daily average of 30 to 40 in-patients. It was proposed that students who successfully completed this training might be remitted one of the three years' course of the Royal Colleges. The proposal was not acceded to as the Hospital could not provide 100 beds for in-patients, and Bedford's admirable scheme could not be implemented. Following the closure of St. Mary's and a select committee's findings on Dr. Bedford's claims for services rendered over the years, he decided to remove with his family to Sydney. On 18th July, 1863, his friends presented him with a massive silver salver and a purse of 250 guineas in recognition of his service to the community. The work of one other remains to be mentioned.

#### DR. E. SWARBRECK HALL AND HER MAJESTY'S GENERAL HOSPITAL.

The work of Dr. E. S. Hall, M.R.C.S., L.S.A., during many years of practice in Van Diemens Land and as the pioneer epidemiologist of the Australian Colonies (Cumpston, 1923) is yet to be fully recognized. A member of the Old Religion and an utterly loyal son of his Church, he became the best known Catholic layman in our Island. Simple and humane he worked primarily for the good of the orphans, the poor and the outcast and exemplified the conception of a christian gentleman. His published work is of great scientific interest and value; and an ardent bibliophile, he published in his latter years a book entitled "Who translated the Bible," in support of the early teaching of his Church.

Dr. Hall arrived in Van Diemens Land on 22nd Aug., 1833, and commenced practice in Hobart Town. Following an appointment as Assistant Colonial Surgeon in 1841, he served at Bothwell, Westbury, Jerusalem. Oatlands, Ross, the Saltwater River, Impression Bay, and in the early fifties at H.M. General Hospital. Whilst at Ross, he touched history, when Miss Catherine Bennett, governess to his large family, married

Thomas Francis Meagher, one of the Young Ireland Exiles, then on parole. After his dramatic escape from captivity (their infant son had died on June, 1852, and lay buried in Richmond Cemetery), Catherine was taken



FIG. V. Dr. E. Swarbreck Hall.

to England by Bishop Willson to join her husband in Ireland. "Meagher of the Sword" crossed to the United States, and as a General of the Federal Army lost his life in the Civil War. No mention will be made of Dr. Hall's outstanding contributions to epidemiology which deserve a full and critical appraisal, but attention must be given to his effort for medical education. On 11th March, 1854, the following advertisement appeared in the local press:

"Medical School at Her Majesty's General School, Hobart Town. At this establishment, which has beds for 300 male and female patients, the undersigned, Resident Medical Officer is privileged to receive pupils for instruction in the Medical Profession. He has been extensively engaged both in private and public practice, in all the branches of the Medical Profession, for upwards of thirty years, and prior to his official appointment, fifteen years ago, on the Government Medical Staff of this Colony, was for many years Honorary Surgeon to one of the largest Medical Institutes in Great Britain. Parents or Guardians wishing to bring up their sons or wards to the Medical Profession will find they can place them here in a most advantageous position for acquiring a thorough knowledge of Anatomy, Physiology, Pharmacy, Materia Medica, Chemistry, Midwifery, Surgery and the Practice of

Physic. Many of the most eminent Medical Practitioners in this and the neighbouring colonies were educated in this Institution. Terms made known on application. E. S. Hall, etc., etc."

A postscript emphasizes that gentlemen educated as above, may be examined and granted Letters Testimonial to practice in the Colony, and so avoid proceeding to Great Britain to obtain their Diplomas.

Unfortunately, in one of its many changes of administration, all the archives of the old Hospital have been lost or destroyed, so there is no record of what advantage was taken of this opportunity. Ten years later, it was a routine for pupils to use its material before leaving for England, among them being my father and two uncles.

#### EPILOGUE.

Let us look back to the sitting room of the home in Collins Street on an autumn evening of 1835. The family are there around the fire. The mother no doubt sewing, beside her husband, and Elizabeth reading aloud from one of their favourite authors, Smollett, Fielding or Scott. The two pupils are with them, George Francis Maddox, who has succeeded John Pearson Rowe (recently departed for Sydney and Liam. The reading finishes and the talk turns thence to Victoria Felix), and the son, Wilto matters of such immediate interest as the latest efforts of the colonists to bring about Trial by Jury and political representation by means of a House of Assembly. An interval follows when all are silent. The young are perhaps dreaming of the years ahead; how little they realize what they are to bring.

For Elizabeth, marriage to Mr. W. Blyth before the year has passed, life on their estate of Bushy Park where her six sons and eight daughters were born, all to be reared to maturity and follow careers in their own Island, the growing colony of Victoria and New Zealand. She will not live to see one of her grandsons, J. B. Hayes, C.M.G., Premier of his State and President of the Senate, another, E. E. Blyth, a Minister of the Crown.

The future holds for George Maddox the long voyage to England, and on his return years of service in the Colonial Medical Administration, and in due course recognition



as an outstanding Physician at Launceston and senior Member of the Court of Medical Examiners.

William, tall, reticent and old beyond his years, has already begun to form the collection of specimens of Natural History that will meet the expenses of his years at St. Thomas' Hospital and the Hotel Dieu, Paris. While he may be confident of success as a leading surgeon in Hobart Town, he cannot foretell such strange activities as these. Ships of his own that will freight produce and framed wooden huts (fashioned at his own mills) to California and bring back gold. Others with whale oil from the Sub-Antarctic, the Indian and Pacific Oceans; guano from the Coral Seas, and in an emergency carrying troops of the garrison at Hobart Town to the war in New Zealand. He may already realize the challenge that will take him after years of intense political activity to the Premiership of the Colony.

#### *In Conclusion.*

Some indication has already been given to the quality and distinguished careers of the pupils trained in Van Diemens Land.

Is it too much to claim that an apprenticeship to a Surgeon of ability and culture, engaged in general practice, may offer something to a pupil that the student of this generation will not find in the impersonal training of a modern University?

#### ACKNOWLEDGEMENTS.

To Miss P. Mander Jones and the Mitchell Library for photostats from the Diary of the Rev. Robert Knopwood, one of which is reproduced, and to Wilfred Hudspeth, Esq., who drew my attention to them, also Dr. J. H. L. Cumpston, who made available the photograph of Dr. E. S. Hall.

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# TUMOURS OF THE PITUITARY BODY AND ITS ENVIRONS.

A note on the Pathogenesis of Complex Cysts and Tumours.

By E. S. J. KING.

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*All things must change,  
To something new, to something strange.*  
Longfellow: *Kéramos* 1.32.

**T**UMOURS of the pituitary body and its environs constitute an involved problem from the clinical point of view because of the various and important structures in the neighbourhood which may be affected secondarily and, in addition, because of the special general physiological disturbances which secretory changes in the pituitary gland may cause in various parts of the body. In addition to this, there is considerable variety, particularly histologically, in the morphological appearances of the conditions found. The pathological features and especially the morphological appearances of a tumour or cyst are important because these determine the name given to the condition and a name will always colour our outlook on the general nature of the disease.

In all parts of the body we find that there are some conditions that are, because they occur more commonly, better known than others and in the case of tumours these have always been regarded as arising from the ordinary structures of the particular organ or gland; but the less well known conditions, because they are less common, have nearly always been regarded as arising from some uncommon or unusual structure. Such hypothetical structures are usually referred to as "cell rests." This is well shown in the present case since glandular hyperplasias and tumours are said to have an unquestioned origin from the normal cells of the pituitary gland, but a para-pituitary group (which is not necessarily para-pituitary topographically) is usually regarded as having an extraneous origin. Opinions regarding the origin of these two main groups of conditions appear to receive further support from differences in structure. In general, the tumours of the gland

are relatively simple in form whereas those occurring in the neighbourhood are often much more complex. It must be appreciated, however, that sometimes the glandular tumours are complicated structurally and on other occasions para-pituitary conditions are simple in form, such as for example, the simple cyst lined by stratified epithelium.

Conditions which are simple in form are regarded as coming from an adult cell; the more complicated structures, however, are derived from a special "totipotent" cell. A variety of structures in a tumour or cyst is considered to presuppose a potential complexity of the originating cell. This is, of course, a relic of the ancient preformation hypothesis which considered that all structure was preformed in the ovum (and, to a less degree, in subsequently formed tissues) and that the elaboration of any organ or part was due to an unfolding of formed material rather than as, in the modern hypothesis of epigenesis, due to addition by multiplication and gradual evolution of tissue.

Of course, if cells or cell groups give rise to complex structures, they must be multipotent. The problem, however, is to what extent is such multipotency limited, if at all, to specific (even though hypothetical) cells or groups of cells.

It must be remembered that it is not possible to determine the developmental capacities of cells from their structure and it does not follow that, because a cell appears to be simple in structure that it must only be unipotent. This question of the potentiality of cells can be studied by observation of some of the more complicated pathological structures.

The presence of several kinds of tissue in a tumour or cyst presupposes multipotency but does not in itself indicate the nature or kind of multipotency nor in what kind of cell this is to be found. The extreme view is that all cells retain total potentialities but the more moderate opinion is that most cells retain potentialities which are demonstrable only in special circumstances and this point of view is supported by the observation that remarkable and indeed unexpected potentialities have, in recent years, been demonstrated with increasing frequency in the tissues of many parts of the body. Even though we do not know the limits of cell capacities it is obvious that they are not as confined and circumscribed as had been thought.

It is clear that when a tumour or cyst develops, only some of the cells of the region show this capacity for multiplication and differentiation. This does not mean necessarily that such capacity was absent from the other cells in the neighbourhood but it is apparent that only certain ones were stimulated actually to demonstrate the peculiarity. Similarly, when a tumour or cyst develops it is found that different changes are to be seen in different parts of it. In other words, both in the inception of the tumour or cyst and during its development, the processes of epigenesis (that is, the development of the structure by proliferation of cells and then differentiation of these) are the mode of formation. It is thus clear that the process of formation of complex pathological structures is comparable with the development of normal tissues in the body.

A limb or an organ is formed by growth of cells which are partially differentiated. The liver or pancreas develops by proliferation of epithelial cells of the gut together with the supporting stroma and blood vessels.

A tumour develops in the same manner; it is a further elaboration of a tissue and may become more complex in form by metaplasia but does not necessarily arise from a cell which is hidden amongst the others and is different in kind because "totipotent."

A common fault, and one which gives rise to many of our (man-made) difficulties, is to assume that we can justifiably overlook our failure to demonstrate stages in the growth of tumours. We can see, under the microscope, some stages of development but it is a common thing to carelessly accept many that we cannot or do not observe.

Of the various methods of classification of tumours, two are important. These are (i) the histogenetic, depending on the origin of the cells of the tumour, and (ii) the histological, which depends on the cellular structure of the tumours. It has been emphasized elsewhere previously and is reiterated here that it is quite impossible, in almost all cases, for us to do more than guess at the origin of tumours. It is sheer assumption—no doubt reasonable in many cases, but nevertheless assumption—that a tumour composed of a particular kind of tissue must necessarily have come from that tissue. This is implicit in many of our statements about tumours. We do not nowadays say that a chondroma must necessarily have come from cartilage cells. We are sufficiently well acquainted with the phenomena of metaplasia to know that this is not always or necessarily true. We do not say that a squamous cell carcinoma of the gall bladder must have come from squamous cells. It can and, in fact, has come from the columnar epithelium of the gall bladder. There are many such examples.

Our names for tumours are, in fact, most often those which describe the histological structure (less often the macroscopic structure or the site of the tumour) and this histological structure—that is, the demonstrable characteristic of the tumour—should be the feature which determines its name. An histological classification is not as impressive as an histogenetic one but is much more scientific. There are difficulties and disadvantages in its application but these are less than those inherent in other methods.

In most parts of the body we have outgrown or are outgrowing the point of view that a complex structure must necessarily be derived from special cells and appreciate that the more complicated tumours are not necessarily something peculiar but are rather more complex examples of the simple tumour and are to be explained by meta-

plastic change in them. The pituitary region, however, is one of the few remaining places in which understanding of this seems to have lagged behind and here we still retain archaic notions about congenital conditions as well as the origin of tumours from "rests" or "cell residues" or the like.

Many of the problems that have arisen round tumours of the pituitary gland, as in some other places, have occurred because we attempt to determine (in the absence of adequate evidence) the origin of tumours rather than being satisfied with what we can be sure about—namely, the structure. This is shown well when we talk about cysts of Rathke's pouch. Of course, we cannot possibly know that a cyst came from Rathke's pouch. It is like an anthropologist protesting that some physical or cultural characteristic of modern man is directly obtained from the Piltdown or Neanderthal Man. In one sense, epithelial structures come from Rathke's pouch but it is foolish and short-sighted to ignore all the numerous cells that have lived in the region between the two periods of early embryonic and adult life.

When a cyst, lined by columnar ciliated epithelium, is said to be derived from Rathke's pouch we have the superficially simple problem of showing how a few special cells have remained unaffected by the many stimuli acting on the area for many years which have changed all the others in the region. Furthermore, squamous cells are lightheartedly attributed to the same (direct) source. As Biggart (1949) says "They are usually considered to be 'rests' of Rathke's pouch. However, Rathke's pouch is not composed of squamous epithelium, and these so-called rests are not at all commonly seen in babies or children, whilst they are extremely common in the glands of adults. It is more probable that they represent areas of metaplastic development of the cells of the pars tuberalis, and indeed pars tuberalis cells may sometimes be found in the centre of the group of squamous cells."

An apparently more intricate problem is that of "tooth germ" epithelium. The morphological similarity of such epithelium to that seen in the jaw is indubitable and this has been regarded as justification for

far-reaching hypotheses. In such tumours we have tissues which are morphologically similar to those occurring in the jaw and which are regarded as being related to teeth structures and designated adamantinomata. These two tissues are now regarded as being identical in type and it would then follow that such a tumour must have arisen from some tooth-germ tissue and since this does not ordinarily arise in the region it must be ectopic tooth-germ tissue.

As relatively precise statements that such epithelium is derived from a displaced blastomere or tooth-germ are shown to be fallacious, other less definite ones regarding cell "rests" or "residues" are invoked. These terms suggest that such material as may not be used in the formation of an organ is set aside—presumably to form tumours. Such a conception, despite having received the benediction of several decades, nevertheless raises more questions than it answers.

#### PATHOLOGICAL MATERIAL

A group of 50 examples of tumours and cysts of the pituitary gland and the neighbourhood has been examined and forms the basis of this discussion. These examples do not differ in any way from those described in the literature so will not be discussed here in detail with the exception of one case, the histological appearances of which will be referred to specially.

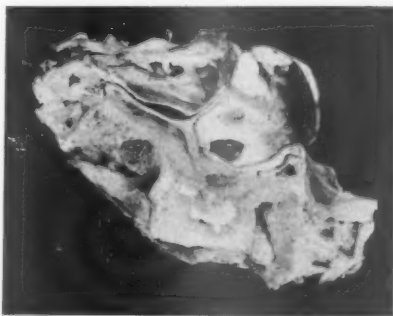


FIG. 1. Photograph of a specimen of the basiphenoid showing the *sella turcica* and an included adenoma of the pituitary gland. The bone and tumour have been cut sagittally in the midline. The tumour has a homogeneous structure except for an area of haemorrhage on the upper and posterior surface. There is a well-defined cyst in the lower part of the tumour. This contained colloid and was lined in part by a single layer of cuboidal epithelium and in part by a stratified epithelium.

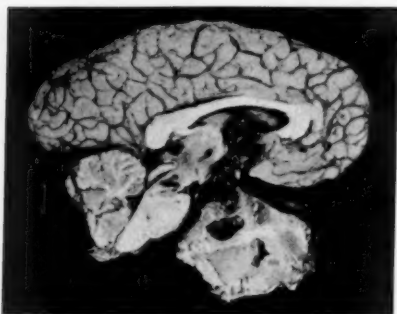


FIG. II. Photograph of the brain and basiphosphoid cut in medial sagittal section, from a male aged 51 who, for many years, had had signs of hypopituitarism and who had more recently developed signs of raised intra-cranial pressure. There is an irregular, elongated cyst, partly involving the intra-sellar portion of the pituitary gland and extending up along the stalk into the third ventricle. It is somewhat irregular in form and shows secondary loculi. In part it contains sebaceous-like material.

In the above group, 43 of the cases were regarded as adenomata of various kinds of the pituitary gland. For the most part, these showed a mixture of cells although in many cases one kind of cell predominated. The point of interest, from the present discussion, is that in several of them there were small cysts in the pituitary tissue. Some of these were lined by a simple cuboidal or columnar epithelium; others had lost the epithelium and were lined mainly by connective tissue. There were two examples, however, in which the epithelium had become multi-layered and, in one case, the small cyst was lined by a definite stratified epithelium of the squamous type.

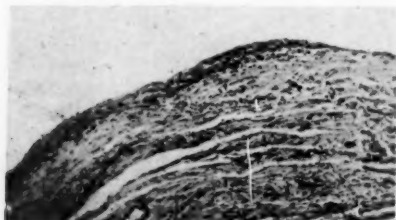


FIG. III. Photomicrograph of a section of the wall of the cyst shown in Fig. II. The epithelial lining is of an irregular stratified type, in part a single layer. (x 36.)

The group of para-pituitary conditions consisted of two tumours and six cysts. One tumour was an anaplastic growth and the

other was an adamantinoma. Of the cysts, five were of the simple dermoid type and one was somewhat more complicated and this is the one which is specially described here.



FIG. IV. Photomicrograph of part of the wall of the cyst showing a lining of a stratified squamous type of epithelium. There are collections of small, round cells scattered throughout the sub-epithelial connective tissue of the wall. (x 36.)

#### CASE HISTORY.

A male, aged 51 years, had had symptoms of hypo-pituitarism for several years and, in the last few months, signs indicative of a gradually developing intra-cranial tumour. The lesion was recognized as being in the pituitary region.



FIG. V. Photomicrograph of portion of the wall of the cyst showing an island of basal-type epithelium. There is a well-defined columnar layer at the periphery, the cells being quite regular in form. In the cell masses themselves, there are areas where the cells are separated from each other by a homogeneous intercellular material. The resemblance of this tissue to that seen in developing germ tooth epithelium and in adamantinoma is apparent. (x 36.)

The patient died and, at post-mortem examination, a cystic mass was found which replaced, within the sella, almost the whole of the pituitary gland and which extended also up along the region of the stalk towards the third ventricle (Fig. II). The cyst was elongated and somewhat irregular in form and appeared to be multilocular and in part contained soft semi-solid material which resembled sebaceous secretion but which had a sheen suggesting the presence of cholesterol. This cyst was about 1½" long and ½" in diameter.

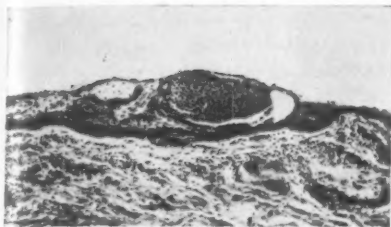


FIG. VI. Photomicrograph of an island of basal-type epithelium seen in the cyst wall. The general form of the epithelium and the peripheral layer is similar to that observed in Fig. V. A small cystic space is seen in the epithelium. There are some round cells scattered throughout the subjacent epithelial tissue. (x 36.)

On section, it was apparent that the mass consisted of a cyst which had some subsidiary loculi communicating with it. The main cavity was lined partly by a pseudo-stratified epithelium, by squamous epithelium and by an epithelium differentiated in the direction of "adamantinomatous" tissue.



FIG. VII. Photomicrograph of a small island of basal-type epithelium in the wall of the cyst. Its relation to the squamous epithelium on the right is clearly shown. An area of homogeneous material within the epithelium is to be seen in one part. The dark area shows beginning calcification of this material. (x 36.)

The predominating epithelium was of a stratified type (Fig. III), but there were many areas where the epithelium was definitely of a squamous form (Fig. IV). Several islands of specially differentiated squamous epithelium were found (Figs. V, VI and VII), but these were everywhere small in size. They showed a thickening of the epithelial layer with the development of a well-defined basal columnar layer. In parts, the epithelial cells were stellate in form and separated by a non-staining material. The appearances very closely resembled those seen in the jaw during the development of the enamel organ and those seen in some of the epithelial tumours of the jaw which are usually regarded as a special differentiation in the direction of tooth structure. In some parts, small cystic areas developed (Fig. VI); in other places (Fig. VII) there was an accumulation of somewhat homogeneous material in the epithelium which was similar in type to that formed by dental epithelium in the preliminary stages of formation of enamel.

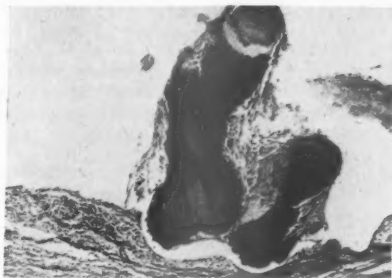


FIG. VIII. Photomicrograph of portion of the wall of the cyst shown in Fig. II. This shows a small island of proliferating epithelium of the special type showing the inter-epithelial masses of homogeneous material which here are for the most part calcified. This material corresponds to calcified enamel as is seen in developing teeth and sometimes seen in tumours of enamel epithelium, the adamantinoma. (x 36.)

That this material resembled dental tissue, in that it had the capacity to take up calcium salts and to form small, irregular masses of "enamel," was demonstrated in several parts of the wall (Fig. VIII). It is thus clear that this epithelium has the capacity to form a calcifiable homogeneous secretion (Fig. IX).

In some areas, there were extremely large accumulations of small round cells, resembling lymphocytes, in the wall immediately under the epithelium. In other places where these were not so prominent, nevertheless smaller accumulations occurred. This is shown in relation to some of the epithelium which is forming calcified nodules in Fig. IX.



FIG. IX. Photomicrograph of portion of the wall of the cyst shown in Fig. II showing areas of thickening of the epithelium with the deposition of inter-epithelial homogeneous masses which are becoming calcified. There is a considerable accumulation of small, round cells, resembling lymphocytes, in the sub-epithelial tissues in this region. (x 36.)

One loculus communicating with the main cavity and in the part near the neck lined by a squamous epithelium was filled with a keratinous material in which there were many spaces which had apparently contained cholesterol crystals. There was



also a certain amount of pigmentation in the wall. For the most part, a definite epithelial lining could not be found and whether the contents had come from the small amount of epithelium that was found near the neck of the loculus (this material accumulating in and distending this region and thus forming a secondary cyst) or whether it had come from epithelium which had now disappeared could not be determined. This area, however, showed a characteristic appearance and had it been present by itself, would have been diagnosed as a cholesteatoma (Fig. X).

Below the epithelium, throughout the wall, there was a thin layer of fibrous connective tissue. In some places this constituted the full thickness of the cyst wall but in the superior part of this cyst it separated the epithelium from glial tissue.

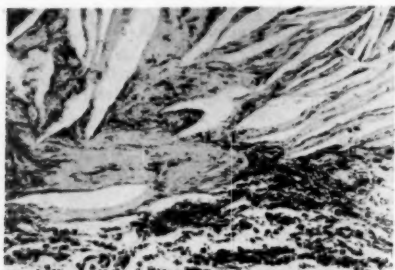


FIG. X. Photomicrograph of portion of the wall of a subsidiary loculus of the cyst shown in Fig. II. The main part of the wall is shown in the pigmented portion in the lower part. The upper part shows disintegrating keratin and characteristic elongated spaces which had contained cholesterol. The general form and shape of these spaces is characteristic of those usually seen when cholesterol has been present in the tissues. In the absence of the main part of the cyst this portion would be diagnosed as a cholesteatoma. (x 36.)

#### DISCUSSION.

To understand the morphological features of diseases of any region, we must comprehend clearly the structure of the regional tissue. The pituitary gland is composed of four parts—the anterior, posterior and intermediate lobes and the tubular part surrounding the stalk of the organ.

The anterior part contains cells of two main types—the chromophobe and the chromophil cells. These are often spoken of as if they were independent of each other but opinion is gradually becoming general that the chromophobe cells are precursors of the chromophil cells. Alveoli sometimes containing colloid are also found in this region. The posterior lobe consists of

nervous tissues and the intermediate lobe contains cells which are like those of the anterior lobe and glands which are described as being like those of the salivary glands. These glands are often disregarded when the pituitary gland is considered but though they may be insignificant in number that is no justification for their being ignored; indeed, since their presence indicates a special direction of growth of the tissues of the region, they demand equal attention with the rest.

Cysts of the pituitary gland, particularly those found in the *pars intermedia*, are regarded as arising from the structures already present there; thus Ewing refers to a cyst of the intermediate area as arising by accumulation of secretion of the "salivary" glands of this part. What is important is that they should be recognized as being derived from the structures already present rather than from the hypophyseal duct or other epithelial "residues."

The tubular part has a structure like that of the intermediate portion of the main lobe. In addition to the glands, there are often groups of squamous cells. As already stated, these should be regarded as morphological variants of the more commonly observed structures. They are not developmental anomalies and it is necessary, in the words of Marcus Aurelius, to "Accustom thyself to the thought that the Nature of the Universe delights above all in changing the things that exist and making new ones of the same pattern . . ."

In a recent paper of some importance, Costero (1948), pathologist in Mexico City, has pointed out that the original tissues which give rise to the pituitary gland have multiple potentialities and he divides these into three groups—typical, atypical and abnormal.

Briefly, the typical potentialities are demonstrated in the ordinary cells of the anterior lobe and the cavities, perhaps containing colloid, lined by columnar or cuboidal epithelium and lying in the just-neural region. Atypical potentialities are shown in the formation of pseudostratified or stratified epithelium with or without cilia.



the formation of squamous epithelium with or without cornification and the formation of tubular glands. These he regards as representing a "mistake of development"—the *Hamartia* of Albrecht. The abnormal potencies are shown in the formation of cavities with a simple columnar lining, the development of lymphoid tissue subjacent to epithelium, the formation of cartilage and the secretion of "calcifiable albuminous substance" giving rise to material resembling primitive tooth tissue.

It has not been, but should be, appreciated that the typical, the atypical and the abnormal, are merely the conditions which are seen usually, sometimes and rarely, respectively. The abnormal is the uncommon condition. The unusual conditions are, of course, only relatively unusual; conditions which were seen rarely a few decades ago are now being recorded more frequently so that the uncommon condition is now less uncommon; thus, as time goes on, with more and more observations, the abnormal condition becomes merely atypical and the atypical becomes a minor modification of the typical. The important point is that during development the body does not make "mistakes"; as the result of different environmental conditions different tissues may be found but these are just as much part of the normal structure (normal for the particular circumstances) as the more usual tissue in the ordinary state.

Tissues which are less usually seen are the result of simple metaplastic changes and, though they may arise early in life, they may also (and frequently do) arise at a late period in the history of the individual. They are due to a change in tissue present at the time and it is quite unnecessary to postulate that they come from tissue which, in some curious (and indeed inexplicable) way, has remained latent. Merely because a condition is observed infrequently it should not be assumed to be therefore fundamentally different from those which are seen more frequently. It is thus apparent that in the gland and its immediate neighbourhood there are many different epithelial structures present which can readily and indeed do give rise to tumours. These cells

are to be seen most commonly in the substance of the gland but are sometimes seen in the neighbourhood. It is difficult to see any reason, other than that of frequency of occurrence, for the view that cells outside the ordinary range of position must somehow be essentially different. "Aberrant" collections of tissue are well known in the cases of thyroid, parathyroid and thymus glands and are found here as "accessory pituitary glandules." We cannot justify the view that Nature has really been doing something peculiar (producing a "mistake") when cells develop outside our arbitrarily determined region. This point of view was, of course, part of the rigid attitude which characterized the turn of the century. We know that all the structures of the body develop partly as a result of the action of an intrinsic force of development but also that this is influenced by environmental factors. Thus, structures are not unalterably predetermined but may be varied both as to their site as well as their form.

As has been indicated previously, tumours of the region are divisible into two groups: (i) Tumours of the pituitary gland itself found usually within the *sella turcica*, and (ii) tumours of the adjacent tissues, or para-pituitary tumours. It happens that this topographical division corresponds, in a general way, with the structure of the tumours. Those of the first group usually resemble in structure the main constituents of the gland whilst those of the second group consist largely of less commonly seen tissues. This has naturally appeared to support the view that the para-pituitary growths arise from special cell groups or residues.

#### *Pituitary Tumours:*

Tumours of the gland may resemble in structure the tissues of the anterior lobe, the posterior lobe or the intermediate part. Anterior lobe tumours may be of the chromophobe or chromophil type. These are tumours which consist of cells of the particular variety designated; their origin cannot be known, that is to say, chromophil cells need not necessarily have arisen from chromophil cells. That the various cells are closely related is shown by the discovery of different kinds of cells in the one tumour.

As in the case of the other ductless glands, many, if not most, of the nodules of tissue found, which are usually designated tumours—adenomata—are not true neoplasms but are localized and often encapsulated hyperplasias. This is important since non-neoplastic conditions as well as tumours may show the features of cellular variation being discussed. In addition to the innocent proliferations (hyperplastic or neoplastic) there is a group in which the cells, though resembling the normal cells, show some variation in form and the tissue mass exhibits the malignant feature of invasion of adjacent structures.

Tumours of the posterior lobe are uncommon; indeed they have been stated not to occur; however, occasional cases have been described. Tumours of the intermediate portion, that is, those in which the structure is that of colloid-containing alveoli, are not common but are well recognized.

Cysts of the gland occur in various forms. Minute cysts are found in ordinary adenomata and these are merely distended colloid-containing vesicles. Gradations are found from these small cysts to larger ones which fill the sella and replace the solid tissue. A slightly distended cleft in the intermediate region may be seen and some cysts—particularly those lined by a ciliated columnar epithelium—are considered to be derived from this. In the absence of precise information such an hypothesis is reasonable.

Cysts lined by stratified and squamous epithelium may develop from squamous epithelium which has already developed in the region. As already indicated, this has appeared by metaplasia in adult life by change in adult tissues. In other cases, the squamous epithelium develops in a small cyst which, since most cysts are found lined by simple epithelium, has probably begun as one of this kind. In either case these cysts develop from adult structures and not directly from misplaced or latent embryonal structures.

#### *Para-pituitary tumours:*

These growths comprise those appearing in the stalk of the gland and those found in the adjacent sphenoid bone or meninges. The stalk tumours and some of those of the intermediate part of the gland are often

referred to as craniopharyngioma on the assumption that they are derived from the hypophyseal duct. However, as has been emphasized already, this is unsupported hypothesis and indeed the evidence indicates that they arise from adult cells—cells which show the capacity of developing in special directions.

These tumours usually grow as malignant formations and consist of masses of epithelial cells which invade and destroy the surrounding structures. They may show a squamous differentiation but sometimes resemble the basal carcinoma of the skin and occasionally may resemble certain tumours of the jaw. This last tumour, to which the term "adamantinoma" has been given, has attracted a great deal of attention. Most accounts of it are mainly devoted to discussions of origins of the cells. There is no question but that the masses of epithelial cells show a peripheral layer of columnar and the middle cells are separated from each other by a homogeneous material. A calcifiable homogeneous material is produced and this may become calcified in small or large areas. The similarity to the adamantinoma of the jaw is indisputable but it appears to be necessary to emphasize that histological similarity does not mean identity.

The para-pituitary cysts are distinguishable from those lying within the sella only by their position. They may be lined by columnar or pseudostratified ciliated cells and in other cases by squamous epithelium. When squamous epithelium produces a large amount of keratinous material this gives a mixture of cholesterol crystals and keratin; such cysts are known as cholesterolatomata.

When cysts or tumours containing several types of tissue are examined it is sometimes possible to obtain a clear indication of the relationship of the various tissues. This can be seen usually more clearly (simply because of dispersion and segregation of cells) in cysts than it can be in tumours.

The main problem is to determine the direction in which processes are proceeding. This cannot be done directly since all that we have in a histological section is a spacial relation and this must be transformed into a time relation. This may be

done by examination of many specimens and, as the embryologist does with foetuses of various sizes, by interpretation of the differences in morphology in terms of time and stage of development.

In regard to the present case, we know that squamous epithelium is a common development. It is often found in small amounts or in only a minute area in a cyst wall so that it is reasonably certain that this tissue arose from previously existing cells, rather than that a ubiquitous squamous epithelium changed into a simple epithelium. There are very many places in the body where such stratified squamous formation occurs; and such changes are well recognized as being a late development in the adult.

Tissue of an epithelial kind resembling a tooth germ is only seen occasionally. In the present case much of the cyst wall lining is squamous in type and there are merely small areas of basal-type epithelium. Since the topographical relation of the two epithelia is so close they are clearly arising more or less together; at the same time squamous epithelium is the tissue commonly seen and may be regarded as the more normal tissue; furthermore the "tooth-germ" epithelium is showing progressive changes with calcification of a special secretion rather than retrogression to squamous tissue. Considering all these points it is probable that the atypical basal-cell tissue has arisen by a change in the squamous epithelium rather than that the squamous epithelium developed from a simple cuboidal epithelium with the basal-type "dental" epithelium as an intermediate stage.

Thus we have the gradual development of what we should regard, if we had sufficient evidence on which to base a judgment, as more specialized tissues—first the formation of a stratified epithelium, then the development of squamous tissue, and finally elaboration of an "enamel-forming" tissue.

The development of lymphoid tissue beneath the epithelium indicates a potentiality of tissue development and a tissue association which is so commonly seen in the head, neck and upper mediastinum that

it can be regarded as approaching the normal. Certainly it does not demand obtruse hypotheses for its explanation.

The locus containing disintegrating keratin and cholesterol does not indicate cellular complexity (beyond the often observed keratinization of such epithelium) but it does add to a gross morphological complexity in the general appearance of the cyst.

The complex cysts differ only in degree from the dermoids and teratomata. The nature of the teratomata is a problem which is merely an extension of the present one but because of much misrepresentation it demands separate attention; this cannot be given here except for the statement that modern pathological and (more important) biological opinion is that these complex growths are closely related to the simple tumours rather than forming a peculiar and separate group of neoplasms.

#### CONCLUSION.

The tumours and cysts of the pituitary region can be divided into two groups according to whether the structure of the new tissue resembles the normal adult tissue of the region or not. Those which are dissimilar are so either because of a complexity of structure, that is to say, several different tissues are found or because a tissue not ordinarily seen in the region is encountered.

When the more complex examples are examined it is found usually that the complexity is more apparent than real. Most of the tissues are to be found in the region in some or other circumstance and often they are to be found frequently. In addition, the tissues are closely related; for example, squamous epithelium is a common development from many other epithelia in various parts of the body.

A basal-type epithelium, particularly one showing an inter-epithelial calcifiable matrix, is often regarded as extraordinary because it has been identified with enamel-organ epithelium. This has led to the apparent necessity for explaining the presence of teeth in the region. In the case here discussed there is such an association

of a basal-type epithelium with squamous epithelium—in amount and distribution—which indicates that the basal-type epithelium developed in a cyst lined predominantly with squamous epithelium. This squamous epithelium in turn is known to develop in every epithelium-lined space in the body, so is not a special problem. Such cysts, lined by simple epithelium, develop often in any of the glandular tissues of the region.

This, therefore, provides an hypothesis of formation which conforms with the modern views of development of tissues. Two centuries ago tissues were regarded as being preformed in some cell or cells. The idea of "cell rests" or "cell residues" is merely a relic of this preformation hypothesis. On the other hand, the development of a tissue, by proliferation and differentiation of one that is already present, is merely the application of the modern view of epigenetic development.

The formation of lymphoid tissue is merely an example of the development of a structure which occurs frequently in other parts of the body, particularly the upper part. Material containing cholesterol is merely the result of epithelial activity (formation of keratin and its disintegration). Cartilage and bone may arise in any connective tissue in the body without special tissues having to be invoked for their formation.

Thus, even the complex-appearing structures, when examined, are seen to be an aggregation of structures which, though apparently different, are actually closely related. The relationships are such as can be well demonstrated often in other parts of the body.

When names such as adamantinoma are applied, it is important that implications regarding identity of structure or origin should not be emphasized. Basal-type epithelium, even though producing calcifiable tissue, is no more a tooth-producing structure (except morphologically) than the cells of the *pars intermedia* are actually "salivary" in nature. An apparently complex tumour or cyst therefore, is not a special kind of structure with a special

origin distinct and different from other tumours. It is merely one in which factors of differentiation, not seen in simple tumours or cysts, have become manifest.

The epidermoid cyst is a simple development from a simple single-layered cyst or from squamous epithelium which has risen from the epithelium of the part. The more complex cysts are merely due to further differentiation of such a cyst and do not need to be derived from hypothetical residual tissues.

#### SUMMARY.

Tumours and cysts of the pituitary region may be simple or complex in form.

The complex structures, usually parapituitary in position are commonly regarded as having an origin directly from such archaic structures as the hypophyseal duct or less clearly recognizable "cell residues."

The assumption that such tumours or cysts arise from special tissues is due to the view that only these possess the potentialities for production of several tissues and that such capacity is not present in more adult structures.

This assumption is misleading on two accounts: (i) the cysts and tumours are not in reality as complex as cursory examination would suggest, and (ii) investigation shows that powers of differentiation greater than those previously recognized are, in effect, present in adult tissues.

The various tissues that are seen in these complex structures develop by changes in cells previously present; thus, the cyst or tumour does not arise like Minerva, fully panoplied, from the brow of Jove but develops by gradual differentiation of proliferating cells in the same manner as is seen in the formation of normal tissues or organs.

In a cyst, for example, there first appears a simple epithelium which may be in part ciliated; this may become pseudostratified or stratified (the former may be ciliated and the second may show keratin formation). The squamous epithelium may then form a

basal-type epithelium with calcifiable homogeneous secretion. Lymphocytic accumulation and cartilage formation occurs and, in areas of excessive keratinous formation, cholesterol accumulation may be found. When all these various tissues and materials are found together the structure becomes one of considerable macroscopical and histological complexity.

The close relation of such complex tumours and cysts to simple ones is thus clear and it is unnecessary to regard the essential progenitor of such structures as a "totipotent" cell or a cell of some special kind. The

complex cyst or tumour is merely a variant of that which, because it closely resembles the tissues commonly observed in the part, is usually regarded as simple.

#### ACKNOWLEDGEMENTS.

The photographs of the specimens were prepared by Mr. R. Inglis, clinical photographer at the Royal Melbourne Hospital, to whom I would tender my thanks.

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## PRIMARY SKIN GRAFT FOLLOWING EXCISION OF FISTULA-IN-ANO.

By E. S. R. HUGHES.

Royal Melbourne Hospital.

A FISTULA-IN-ANO is an abnormal, acquired track between the skin and anal canal. Only very occasionally is this track obliterated by granulation tissue growing inwards from the walls, i.e., healing by "third intention." It is not uncommon for partial closure to occur, but pockets remain and are the source of recurrent abscess formation.

To cure a fistula-in-ano, the track must be laid open and converted into a flat wound, so that this inefficient method can be replaced by others known to succeed. Most fistulous tracks enter the anal canal just above the subcutaneous part of the external sphincter (low anal fistulae). No functional impairment follows division of this part of the sphincter, and it is usually not difficult to convert the fistula into a flat wound (Fig. I).

completely, as a result of which the time in hospital is out of proportion to the length and severity of the operation.

To avoid this prolonged convalescence, some surgeons have advocated excising the fistula, followed by primary suture of the wound. Without doubt, success will follow a number of such operations, and the time in hospital considerably reduced. But there is a danger; unless all the dead space is obliterated, recurrence is likely (Fig. II).

A second way to shorten convalescence is to place pinch grafts or small patches of split skin on the granulation tissue two or three weeks after the fistula has been excised. This means a second operation, followed by several days of strict bed rest, so that the hospitalization period is not materially shortened although the actual healing time is lessened.

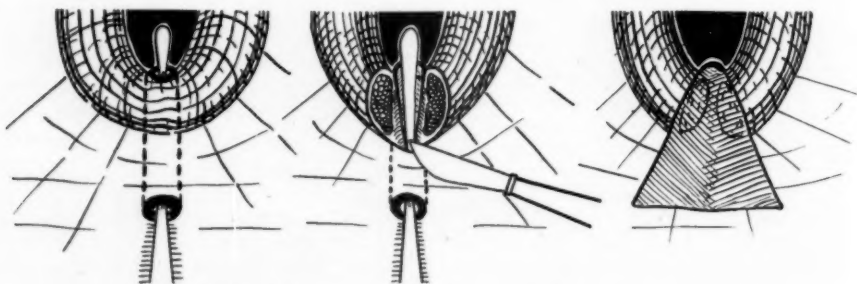


FIG. I. The technique of laying open a fistula-in-ano. A large, flat wound remains.

The majority of surgeons allow the wound to heal by "second intention." The wound granulates and the epithelium grows from the edges over the granulating bed. Whilst it is easy to obtain a flat wound at operation, it requires careful attention in the post-operative period to ensure that this wound remains flat, and will heal by second intention and will not form pockets, and so revert to third intention healing and favour recurrence. The wound left after excising a fistula takes five or six weeks to heal

### Primary split skin graft following excision of a fistula-in-ano.

A split skin graft will take on most raw surfaces; it does not require a surface of granulation tissue. The presence of organisms is no contra-indication, and even when contamination has resulted in actual infection, skin grafts will still take on the area. The graft must be firmly in contact with the recipient area and not separated by clot, ligatures *etcetera*.



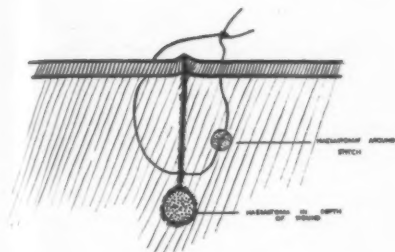


FIG. II. Primary suture is unsafe, because of the difficulty in obliterating completely all potential space. A collection of blood in the depth of the wound or around a stitch may become infected.

After conversion of the anal fistula into a flat wound, a thin split skin graft is applied over the whole area. The grafts are kept in position with *tulle gras*, and cotton wool moistened with saline. The patients remain in bed and the bowels are confined until the fourth post-operative day when the grafts are inspected; the bowels are then allowed to act, and any part of the wound which remains uncovered by skin is managed by the usual daily routine of bowel action, bath, and dressing (Figs. III, IV).

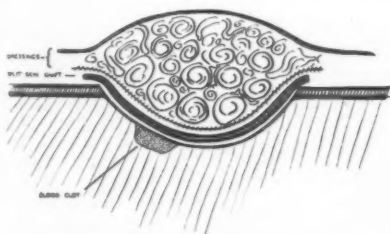


FIG. III. A split skin graft placed on the wound will take. If a clot should separate the graft from the tissues it will not remain as a source for recurrent sepsis because the overlying skin graft will slough, and healing will take place by second intention.

The only disadvantage of the method is pain at the donor site for a day or two after the operation. If the graft does not take at all nothing has been lost. When the graft takes in the peripheral part of the wound only, the absence of induration and contraction associated with second intention healing facilitates the close observation necessary in the inner and anal part of the wound.

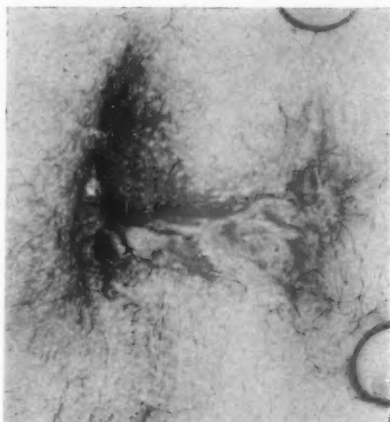


FIG. IV. A fistula wound on the thirteenth post-operative day; 75 per cent. take. (Case 2)

The results obtained by primary skin grafting in three consecutive cases of low anal fistula are summarised in the Table. The time in hospital in each case was approximately seven to ten days less than average; whilst the time taken for complete healing was reduced by 50 per cent. More than half the graft retained its viability in each case. The wounds were less painful than usual, were not associated with the induration possessed by those healing by second intention, and observation of any part healing in the latter way was rendered easier. No special pre-operative preparation of the bowels was used; following operation penicillin was given for several days.

#### A SUMMARY OF THREE CONSECUTIVE CASES.

Case	Days in Hospital	Days for Complete Healing	Per cent. Take of Graft
1	11	20	75
2	12	21	75
3	12	21	70

#### ACKNOWLEDGEMENT.

I wish to thank Mr. Inglis, Clinical Photographer at the Royal Melbourne Hospital, for the photograph.

## THE SCOPE OF TOTAL PROSTATECTOMY.

By S. C. FITZPATRICK AND A. D. MATHESON.

*Hamilton.*

**C**ARCINOMA of the prostate occurs in approximately twenty per cent. of patients who present for treatment of urinary obstruction. In men over fifty, it is the most frequent of all malignancies. The incidence increases with age. As in early malignant changes in other glands, there is a stage in cancer of the prostate before signs and symptoms occur and diagnosis is impossible in such cases except by chance. Until section of portion of the excised gland is carried out, diagnosis is uncertain in early cases. All present methods of investigation of early suspected cases miss a high percentage of malignant cases.

Treatment is not sought by the patient in the latent phase. By the time the patient presents with obstructive bladder neck changes sufficient to cause some urinary retention, many authorities consider that the operability rate has fallen to five per cent.

Total prostatectomy by the perineal route which, in Young's hands, gave a survival rate of thirty to fifty per cent. for five years and upwards, is an operation followed by a high incidence of stricture and incontinence (Young, 1936).

Oestrogen therapy gives satisfactory temporary relief but the closing phase is usually as distressing as formerly.

The general position of treatment of cancer of the prostate is therefore far from satisfactory (Kirkland, 1951). If it is practicable to remove the prostate early and completely by a method which has a low operative mortality and negligible sequelae, the onset of malignant change can be forestalled.

Since September, 1947, we have been using Millin's retro-pubic approach to the prostate (Millin, 1947). By September, 1950, we had performed fifty retro-pubic enucleations with two deaths and five retro-pubic total prostatectomies with no deaths. We found that by this method, total removal

of the prostate as compared with partial removal (enucleation) resulted in no increase in complications. Total removal of the prostate has the special advantage of control of haemorrhage by ligation of the blood supply of the viscera which are removed, in this case by ligation of the prostatic branches of the inferior vesical vessels. There have been no instances where primary post-operative haemorrhage in the operation area has caused any worry. One case of carcinoma of the prostate with urinary infection which had a secondary haemorrhage on the seventh day required surgical relief.

Encouraged by the smooth post-operative course of these patients, we decided to perform total removal of the prostate in every case in which no contra-indication existed. Between September, 1950, and September, 1951, we performed forty-two total prostatectomies with four deaths.

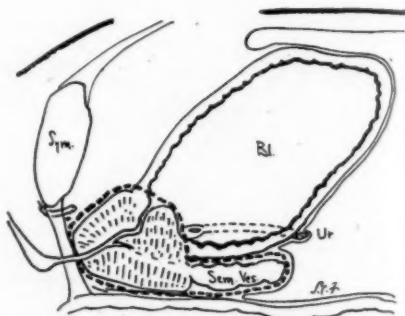


FIG. 1. Diagram of a sagittal section of part of the male pelvis; the broken line indicates the structures removed in total prostatectomy.

### OPERATIVE TECHNIQUE.

A short-beaked metal bladder sound, number eight, is introduced into the bladder to act as a guide. A transverse lower abdominal incision is made, the rectus sheath is divided longitudinally, the recti separated and the peritoneum swept upwards by gauze dissection exposing the bladder and prostate. Care is taken to

avoid injuring any exposed veins near the pubis. If necessary in obese subjects, a better exposure may be obtained by making a transverse cut through the rectus sheath on each side of the midline, about two centimetres above the pubis.

A Balfour type self-retaining retractor is fixed in position in the wound, the third blade especially made to depress the bladder away from the supra-pubic area, is then secured in position. By gauze and finger dissection, the loose areolar tissue is cleared to define the space on either side of the prostate. To ligate the veins emerging from beneath the pubis, two parallel rows of interrupted catgut sutures are inserted through the pre-vesical fascia as close to the pubis as possible using Young's boomerang needle.

A transverse incision between the two rows of sutures is carried down to the apex of the prostate, aiming at the junction of the membranous and prostatic urethra, the metal sound acting as a guide. The pubo-prostatic ligament on each side is divided.

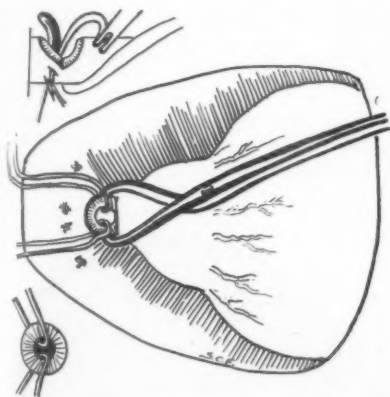


FIG. II. Diagram of the male pelvis, opened ventrally to show the accurate placing of two sutures in the distal stump of the urethra before completing its division.

At the apex of the prostate, the urethra is incised transversely through half of its circumference. The metal sound is now withdrawn until the tip projects upwards through the opening made in the urethra. Two catgut sutures are passed through the wall of the urethra, one at the three o'clock

position and the other at the nine o'clock position and the ends are held outside the wound with haemostats (Fig. II). These two sutures are later used to approximate the bladder and urethra after removal of the prostate. As the completely divided urethra retracts immediately beneath the pubis, it is more convenient to insert these sutures at this stage.

To obtain an adequate exposure of the urethra, it is generally necessary to exert some traction cranially and posteriorly on the prostate. For this purpose we use an instrument (Fig. II), the jaws of which encircle the apex of the prostate, but the minimum amount of pressure only is used as we think too great a disturbance of the membranous urethra may cause either temporary or permanent damage to the neuromuscular sphincter mechanism.



FIG. III. Diagram of the male pelvis to show the bladder opened ventrally; a probe is inserted in the right ureter; haemostats have been placed on the prostatic branch of the inferior vesical pedicle and the artery to the vas.

The urethral metal sound is now withdrawn and the urethral division completed. The apex of the prostate is grasped with tissue-holding forceps and rotated anteriorly. The posterior surface of the gland is easily separated by gauze dissection from the underlying fascia of Denonvilliers. The dissection is carried cranially until the seminal vesicles come into view with the peritoneum between them.

The prostate is then returned to its normal anatomical position. The bladder is opened in the midline close to the prostate and the

opening enlarged transversely. While examining the interior of the bladder, the ureteric orifices are identified and the division of the bladder wall completed.

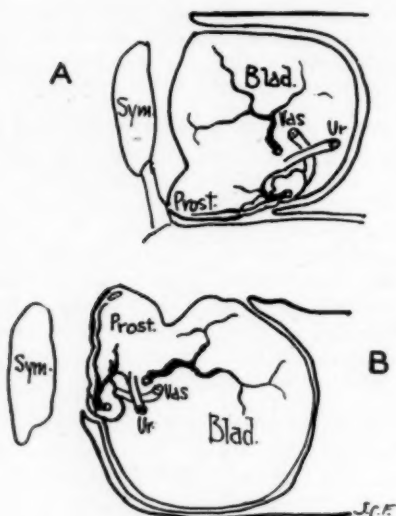


FIG. IV. (a) Diagram of part of the male pelvis to show the relative position of the superior vesical vessels and the inferior vessels in recumbency.

(b) Diagram of part of the male pelvis to show that when the prostate has been drawn up into the wound, the inferior vesical vessels are now rotated towards the surgeon and this facilitates ligation.

First on one side, then on the other, a fine metal probe is inserted for a distance of three centimetres into the ureter. The vascular pedicle on each side of the prostate is clamped, divided and ligated (Fig. III), and the probe removed from the ureter. The *vesiculæ seminales* are mobilised and the *vasa efferentia* divided (Fig. V).

The aim is to remove the prostate and vesicles with their investing fascial layers in one block of tissue so that there is a minimum of disturbance of the lymphatics which may contain malignant cells.

A number twelve rubber catheter is passed *per urethram* into the bladder. The two sutures formerly placed through the wall of the urethra are passed through the bladder

wall in appropriate positions on either side of the midline. Tying of these sutures approximates the bladder and urethra without tension, the urethral catheter acting as a splint (Fig. VI). The catheter is fixed in position by a suture passed through the tip of the catheter, the bladder wall and the abdominal wall. A rubber drain tube is inserted into the retro-pubic space and the abdominal wall closed in layers.

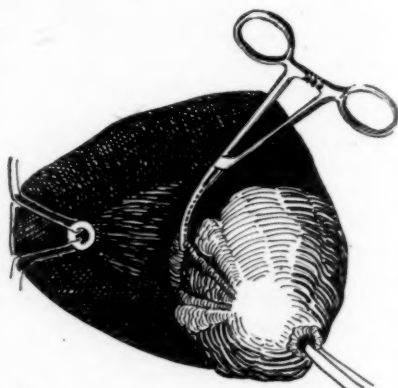


FIG. V. Diagram of the male pelvis to show the prostate drawn upwards and to the left side; a curved haemostat has been placed upon the right vas close to the peritoneum which appears as a pale bluish area.

Before the patient is transferred from the operating table, the patency of the catheter must be proved.

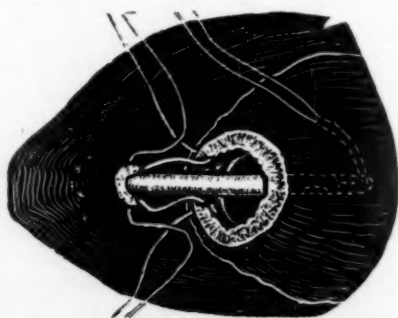


FIG. VI. Diagram of the male pelvis to show how the two sutures originally placed in the distal stump of the urethra are now utilised to approximate the bladder base accurately to the urethra. The catheter has been placed in position within the bladder.

## POST-OPERATIVE TREATMENT.

The catheter is removed on the eighth post-operative day. Complete urinary control is usually complete in two to three weeks.

In addition, hormonal therapy is used in all cases of suspected and proved carcinoma.

TABLE 1.

For period September, 1947 to September, 1950.

Type of Operation	Number of Cases	Mortality
Trans-urethral resection	17	1
Retro-pubic enucleation	51	2
Retro-pubic total prostatectomy	5	0

TABLE 2.

For period September, 1950 to September, 1951.

Type of Operation	Number of Cases	Mortality
Trans-urethral resection	9	1
Retro-pubic total prostatectomy	42	4

*Causes of death in retro-pubic total prostatectomy.*

- No. 96. T.M.H., aged 77 years; died 30th post-operative day; atherosclerosis and cachexia.
- No. 100. C.W.B., aged 71 years; died 4th post-operative day; coronary atherosclerosis.
- No. 115. J.J., aged 84 years; died 23rd post-operative day; uraemia.
- No. 117. F.P., aged 73 years; died 21st post-operative day; pulmonary thrombosis.

## SEQUELAE.

(1) Incontinence. Some of these patients were troubled by dribbling for the first twelve to fifteen days after operation; subsequently they have developed full sphincteric control.

(2) Stricture. There is no method of prostatectomy in which the urethra is not interrupted in its continuity and it is inevitable that there should be some patients who will require one or two dilatations after operation. This sequel has not troubled us after total removal more than after any other form of prostatectomy. Up to date we have met with no patient who has required continued dilatation except where there has been a stricture of the urethra existing prior to prostatectomy.

(3) Osteitis pubis. This complication occurred in two cases who were treated early in this series.

(4) Loss of sexual power. Only two of our younger patients have complained of this sequel. We discuss this possibility with patients prior to operation on the basis that it is part of the price to be paid in attempting to gain freedom from prostatic malignancy. It is to be noted that administration of oestrogens also leads to this result.

## DISCUSSION.

In 1904, Hugh Young first performed radical prostatectomy by a well-planned block removal of the involved tissues based on a sound appreciation of the pathological problems involved. The survival rate of Young's series stands as one of the highest achievements in ablative surgery of cancer of an internal organ. Radical prostatovesiculectomy by the retro-pubic approach is fundamentally the same operation as Hugh Young's but possesses the advantage of a negligible incidence of complications.

This series is too short and too recent to warrant detailed analysis or to draw conclusions. It is given rather as a preliminary report which may stimulate others to study the use of this operation.

We consider that the scope of total prostatovesiculectomy should be extended to include almost all patients who normally



would be considered suitable for enucleation and especially all cases where malignancy is suspected.

#### SUMMARY.

Total removal of the prostate and seminal vesicles by Millin's retro-pubic approach was carried out on forty-seven cases with a mortality of four cases, and few complications. The technique is described. The total removal of the prostate has special

advantages over enucleation. Its scope in the treatment of carcinoma should be fully explored.

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## CONGENITAL MALFORMATIONS OF THE UROGENITAL TRACT AND RECTUM.

By J. D. HICKS.

*Royal Melbourne Hospital.*

**D**URING the last decade the chief interest in congenital deformities has been the demonstration of many factors which influence the development of the foetus and lead to the production of abnormalities.

Some of these factors are changes in the intra-uterine environment of the foetus, although a number may derive from the abnormal action of the chemical organizer system and are probably genetic in origin.

In the human being, it has been demonstrated clearly that infections in the mother (and foetus), such as rubella, may lead to malformations if the disease is active during critical stages of organ development.

In animals, experimental deficiencies of nutrition, of vitamins in particular, have been associated with malformations while on the genetic aspect the regular appearance of deformities in mutant strains has indicated the effect of altered genes or groups of genes.

Now and again new combinations of imperfectly developed organs are described and the following case appears to be of unusual interest, not only in the particular group of abnormalities found in one individual but also in the obstetrical complication which ensued.

The following history accompanied the specimen:

Forceps had been applied to the head of a foetus in an attempt to relieve an obstructed labour. The head came away with the forceps and the arms of the child followed suit, but the body remained inside. In this state, the mother had been admitted to hospital. The uterus was larger than would be expected for the period of amenorrhoea (32 weeks) and, in fact, was larger than is usual at term. It was tense, rounded, and felt cystic. The thorax and abdomen of the foetus were punctured, and the escape of several pints of straw-coloured fluid allowed the trunk and lower limbs to be born.

Two previous pregnancies had brought forth normal children, aged five years and fourteen months respectively.

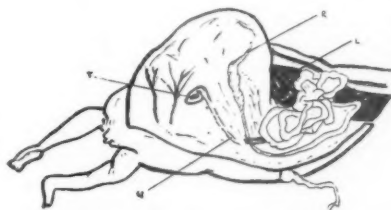


FIG. 1. Specimen viewed from the left antero-lateral aspect:

On the side of the distended bladder can be seen the testis (T) circled by the vas which joins the ureter (U). The rectum (R) is filled with meconium. The intestines are pushed up under the liver (L). The stretched umbilicus and the cord are seen below. (The rectum has been drawn in continuity with the colon.)

The specimen (Fig. 1) presented at its cranial end the ragged and open thorax, the bones and torn muscles of the shoulder girdle indicating the avulsion of the head and arms. After birth of the trunk, a long exploring incision had been made so that the abdominal cavity was now laid widely open, from xiphisternum to pubis, the thin wall lying in folds on either side of a large flabby cyst, which had also been opened. There was some diastasis of the recti and the umbilicus measured 7 by 5.5 cm., with the cord inserted at the upper pole of this area.

In the thorax, the heart lay in its pericardium. It appeared to be normal. On either side was a very small unexpanded lung and a relatively small thymus hung down in front of the trachea. The thyroid was still attached to the upper end of the trachea and the larynx was intact.

Beneath the diaphragm a slightly torn liver partially hid from view the loops of intestine. The large cyst, which had been about 16 cm. in diameter, had apparently pushed the liver and bowel under cover of

the ribs, and so occupied the remainder of the enormously distended abdomen. It was covered in front with peritoneum but posteriorly the wall was adherent to the layers of thin retro-peritoneal fascia.

In this area, on the left side of the tumour, lay a small testis (1 by 0.6 by 0.2 cm.) with epididymis and *vas deferens* and a strand of tissue leading down to the left inguinal canal.

On the outer aspect of the cyst wall, a centimetre above and anterior to the testis, an oval white thickening 2 mm. in diameter was discerned. The thickening or cord of tissue ran upwards and backwards for about 8 cm., leading to the hilum of the left kidney. The kidney was normal in size and position, lying behind the upper portion of the cyst.

Within the cyst, in the region of the lower end of the cord-like thickening, was an opening through which a probe could be passed smoothly into this cord and along it up to the kidney. The cyst was thus identified as the urinary bladder, the opening in its wall as the left ureteric orifice and the thickening on its wall as the ureter. The *vas* made a small circle around the testis to meet this ureter on its upper anterior aspect.

No ureteric orifice, ureter, renal or gonadal tissue was found on the right side.

Inside the bladder the trigone could be defined, considerably stretched, with the left ureteric orifice 8 cm. from the midline. At the apex of the trigone a tiny opening led into the urethra. A probe could be passed along the urethra as far as the base of the penis. The penis was small and from the meatus on the under surface of the glans a probe could be passed back up the urethra only as far as the root of the penis. Dissection of the perineum, though it failed to disclose the site and nature of the obstruction, showed a continuous strand of whitish tissue in the position of the urethra and that the probe could not be made to follow a definite enclosed track.

The scrotal skin appeared to be normal, the sacs were potential. The inguinal canals contained only loose areolar tissue.

Turning our attention to the gastrointestinal tract, the stomach was small,

pushed up well under the diaphragm, and led to the small intestine which was traced down to the appendix and caecum. The colon led upwards and across the midline to the splenic flexure and then downwards. In this region the bowel was torn completely across, probably during delivery, leaving a free open sigmoid colon.

A rectum could not be found on searching the pelvis. There was no anus, nor even a depression of the skin to mark its site. The continuation of the bowel, the terminal 10 cm., was picked up on top of the bladder to which it was adherent. Here the bowel contained greenish meconium.

A probe, inserted into the bowel, passed readily into the bladder at a point 23 cm. from the internal opening of the urethra and 21 cm. from the left ureteric orifice. The opening may have been in the midline, but this could not be determined definitely as the bladder had been opened and displaced before the specimen was received.

The spleen was not found, possibly being torn off during birth of the trunk. The pancreas appeared to be normal. The suprarenals were disc-like, about 2 cm. in diameter, much smaller than is usual in a foetus of this age.

The microscopic structure of the kidney was normal, that of the testis corresponded to a normal development up to the eight month of foetal life. The bladder was lined by a stratified epithelium, the cells becoming squamous in character near the surface. Sections were taken at several levels of the penile urethra and membranous portion in an attempt to trace the continuity of the lumen. A channel lined by transitional epithelium with numerous glands around it was seen in every section, but the point at which the block had occurred was not found.

#### DISCUSSION.

There are four main abnormalities in this specimen: malformation of the rectum, agenesis of the right kidney, absence of the right testis, and occlusion of the urethra.

It is convenient to discuss these separately.

*Malformation of the Rectum.*

There is considerable divergence of opinion as to the classification of the different types of rectal and anal abnormalities which may occur, largely because of the numerous variations and combinations of the separate defects encountered in individual cases. Kaufmann, in his "Pathology," bases his classification, as far as possible, on embryological grounds. He distinguishes 3 groups:

1. *Atresia ani* (rectum ends blindly just beneath the skin).
2. *Atresia recti* (anus present as a short blind pouch, the rectum ending blindly some distance above it).
3. *Atresia ani et recti* (no anus, rectum ending blindly higher up in the pelvis).

If no communication with another organ exists these groups are called simplex. Where such communication is present the designation *vaginalis*, *vesicalis* or *prostatica* is added, as the case may be. The groups are further divided into one series where the communication is developmental in origin and into another where it is in the nature of a secondary fistula.

It is obvious that Ladd and Gross (1934) have found it difficult to assign the varied conditions they observed to these relatively simple groups. The abnormalities pertaining to their series are classified in four groups, which I propose to define less rigidly than they, under the following headings:

1. Stenosis of the lower portion of the rectum or anus.
2. Imperforate anus, rectum and anus in contact but separated only by a membrane.
3. Imperforate anus, the rectal pouch ending blindly some distance from the anus.
4. Anus normal, the rectum ending blindly. There is obstruction by a membrane or complete separation of the pouches.

To these four groups may be added the occurrence of fistulae, particularly in groups

three and four. Ladd and Gross reported 162 cases; 21 of type 1, 6 of type 2, 117 of type 3, and 18 of type 4. There were 4 fistulae in the first group and 81 in the third. In the male fistulae were either recto-vesical, recto-urethral, or recto-perineal. In the female recto-vaginal and recto-perineal were the more common forms.

It is difficult to assign the present case to any one of these groups as defined by Kaufmann or by Ladd and Gross. There is no anus, and the rectum (or colon) ends some distance from the pelvic floor, so that type three of both series is the most likely group. The communication between the rectum and the bladder is direct. There is no pouch or blind end to the rectum and the track into the bladder does not appear to be fistulous. The case would seem to fit into Kaufmann's group called *atresia ani et recti vesicalis*, noting that the recto-vesical communication is probably developmental in origin.

The frequency with which such an anomaly is found is generally reckoned to be about one in 5,000. Berman (1938) reported 23 cases in 34,454 autopsies, and quoted other figures with the much lower rate of 3 cases in 66,654 autopsies. Associated abnormalities were present in 13 cases (56 per cent.). Ladd and Gross found other abnormalities in 43 cases (26 per cent.), some having as many as seven or eight defects. Vasilas (1949) records 17 cases in 30,000 births, all of these cases had more than two associated anomalies. The kidney and ureter were absent in one of Berman's cases and in two of Ladd and Gross's. In none was the absence of a gonad reported.

*Absence of the Kidney.*

A solitary kidney is found about once in 1000 autopsies (Soloway, 1939; Gutierrez, 1933; Collins, 1932). It may be normally situated, the ureter may or may not cross to the opposite side, or the kidney may be ectopic (Stevens, 1937). Collins (1932) collected the original reports of 572 cases of solitary kidney and added 9 from the records of the Mayo Clinic. He stressed the distinction of true agenesis or congenital absence of the kidney from aplastic, hypoplastic or atrophic conditions. Gutierrez

(1933) is of the opinion that the diagnosis of true congenital solitary kidney rests on the absence of half the trigone of the bladder and one ureteric orifice, with absence of the renal artery and the suprarenal capsule.

Hinman (1940) stresses the necessity of microscopic examination to exclude atrophy or renal tissue. Although renal agenesis may be the only defect, associated genital abnormalities are present in a high percentage of cases. Collins (1932) found them in 58 per cent. of his cases (in 89 per cent. of 209 female cases). Cases of combined renal and genital anomalies are reported quite frequently (Grasby, 1948). In only 4 instances was the testis absent and atresia or absence of the anus or rectum was found only 7 times.

The emphasis placed by Gutierrez on the absence of the suprarenal capsule in the diagnosis of true agenesis of the kidney does not seem to rest on sound embryological facts. Later writers, such as Hinman (1940) and Grim (1940) give a better account of the development of the kidney. The mesonephros or Wolffian body begins to appear at about the 3 mm. stage (the third week) and lies opposite the future fifth cervical to third lumbar segments (Fraser, 1932). The capsule of the suprarenal forms from cells lying between the upper portions of the Wolffian bodies. The cell groups appear at about the 5-6 mm. stage (the fourth week) and are at first in contact with the lung bud at their cranial end. Caudally they are separated by the Wolffian body from the metanephros which develops, some time later, in the intermediate cell mass below the level of the fourth lumbar vertebra. The metanephros comes to lie dorso-laterally to the Wolffian body (Fig. II), and it is not until the 16 mm. stage (the sixth week) that the kidney comes into contact with the large suprarenal and indents its caudal aspect.

If the absence of both kidney and suprarenal is to be explained by the action of a single factor, that factor can operate either at a late stage of development when the suprarenal and kidney are in contact with one another or at an early stage when

development of that part of the embryo containing the renal and suprarenal elements is involved.

In the former case, both kidney and suprarenal will be well established before they are in contact with one another (at the 16 mm. stage) and it is unlikely that a single factor would destroy them both. If the latter instance pertains, the Wolffian body and the anlage of the suprarenal capsule are involved together at such an early stage that the metanephros or true kidney never appears.

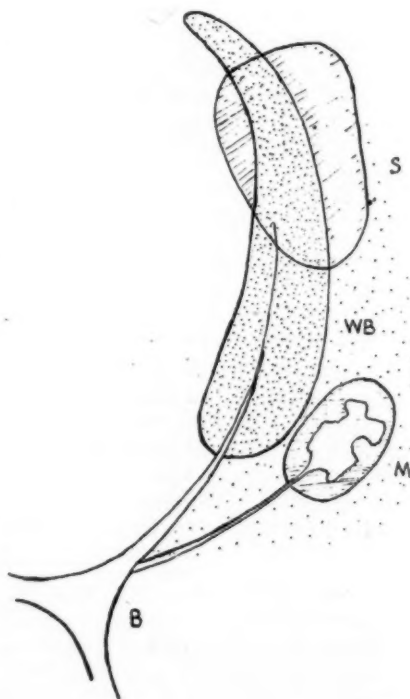


FIG. II. 13.5 mm. stage. The suprarenal (S) lies in front of the upper portion of the Wolffian body (W.B.), the lower portion separating the suprarenal from the metanephros which lies dorso-laterally. Bladder (B).

In such circumstances one would also expect the absence of the gonad. In only rare instances would absence of the suprarenal capsule and of the kidney occur together.



Both suprarenals were present. As the foetal adrenal is a soft vascular structure, their small size in this specimen is attributed to the greatly increased intra-abdominal pressure. The suprarenals are usually present in cases of bilateral absence of the kidneys (Hinman, 1940, Grim, 1940). Hinman lists the events which lead to agenesis of a kidney as: (1) Failure of the ureteral bud to develop. (2) The bud appears, but fails to reach the nephrogenic tissue. (3) The metanephrogenic cap may fail to develop. (4) The primitive metanephros may atrophy and disappear.

As there is no evidence of a ureter on the right side in this case, the aetiological factor may have been a failure of the ureteral bud to develop.

#### Testis.

The gonad appears during the fourth week as a proliferation of the lining layer of the coelom on the medial side of the urogenital ridge. By the sixth week (16 mm. stage), separation from the Wolffian body is occurring and a mesorchium is being formed (Fig. III). Absence may be due to a failure of the genital portion of the ridge to develop, or to non-development of the whole urogenital ridge, when kidney, vas and ureter will also be absent. The suprarenal capsule, as mentioned above, may be also involved in this process.

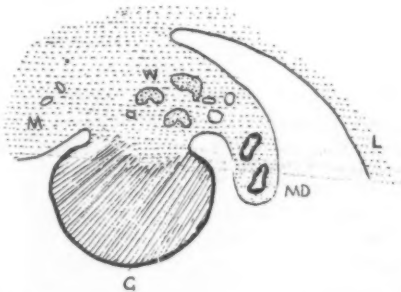


FIG. III. 16 mm. stage (exaggerated). To the left of the midline (M) the urogenital ridge projects into the coelom and is dividing into a lateral Wolffian body (W) with its Mullerian duct (MD) and into a medial gonad (G).

Cryptorchidism is relatively common but true absence of the testis is very rare. The true anatomical state, of course, can be

established only by surgical exploration or at autopsy. Counsellor *et alii* (1940), in reporting 7 cases of monorchidism, could find in the literature only 47 cases of absence of the testis, 11 bilateral, 36 unilateral. Papers by Flett (1936) and Thorek (1933) illustrate individual cases and Thorek gives a simple classification, according to the extent to which other structures such as the epididymis and vas are missing. The presence of other abnormalities is mentioned in very few cases. Absence of all mesonephric structures is seldom noted, there being present some remnant of the spermatic cord or efferent tubules in most cases. In such instances, careful microscopic examination of the neighbouring tissue may be necessary to exclude atrophy of the testicular tissue.

The case which bears closest resemblance to the present one appears to be that reported by Kretschmar (quoted by Counsellor, 1933), a child who lived eight days. There was complete anal atresia and meconium and faeces had been passed in the urine, a fistula through the prostate connected the rectum and the urethra. Testes, spermatic cords and seminal vesicles were absent.

In the present specimen a reasonably accurate explanation of the absence of the kidney and testis can be made. It is assumed that the causative factor was a developmental failure of the right urogenital ridge at an early stage. Mesonephric structures, such as the *tubuli efferentes* and the *vas deferens*, are absent, and also the gonad itself which arises from the medial side of the Wolffian body. The metanephros or adult kidney has not appeared, probably because there was no ureteric bud to stimulate and orientate the metanephrogenic tissue of the intermediate cell mass caudal to the Wolffian body area.

#### Atresia of the Urethra.

The literature on congenital stricture of the urethra is mainly concerned with partial obstruction of the urethra, most commonly by thin membranous or valvular structures, and its treatment in living patients.

Sheldon (1937-38) describes how stasis is produced in the urinary tract, followed by infection, and the patient may die from

pyelonephritis. In several cases reported, relief was obtained by trans-urethral resection of the obstructing valve or membrane.

No reports were found of cases of stricture of the urethra in stillborn babies, nor of cases with gross distension of the bladder. In this case I was unable to determine the exact nature of the obstruction, but microscopic examination showed an epithelial-lined tract on either side of the block. The urethra above the block was not dilated, so it is likely that the pressure within the greatly distended bladder compressed the prostatic portion of the urethra in a valve-like manner.

#### EMBRYOLOGY.

Perhaps the closest approach to the description of the morphological changes that have taken place can be found in the reports of Glueckson-Schonheimer (1945), who described a sequence of events in embryos of certain strains of mice showing malformations of the hind end. Embryos of this mouse strain, heterozygous for *Sd*, showed defects of the spine, urogenital system and intestine. Development proceeded normally up to the tenth day after fertilization when a cellular degeneration commenced in the mesenchyme of the tail, chromophilic granules appearing in the cells and pyknosis following. Later, there were haemorrhages, apparently from defects in the walls of the blood vessels, producing further damage, in the notochord, neural tract and somites.

Normal development of the ureteric bud from the mesonephric duct did not occur and failure of branching of the bud at its outer end, normally seen on the eleventh day, was followed by failure of differentiation of the metanephrogenic caps of mesenchyme. In the newborn mouse the kidney was either absent, or if partial branching of the ureteric bud had occurred the size of the resulting kidney depended upon the degree of branching.

In embryos homozygous for the *Sd* mutation changes were more extensive and defects in the posterior portion of the mesonephric ducts were seen about the ninth day. In

many cases, two ureteric buds formed on each side, but neither bud grew normally and the metanephrogenic tissue was not stimulated adequately. In these embryos, about the tenth day the cloaca was seen to be abnormally small, it failed to separate into urogenital sinus and rectum, and from this stage further development was abnormal.

There is obviously a primary abnormal change behind the earliest morphological variation observed. This is probably biochemical in type and, although this change may be widespread, the defect may become manifest only in those tissues which are more sensitive at that particular time.

The mice described by Glueckson-Schonheimer were heterozygous or homozygous for a single mutation *Sd*, and these abnormalities were regarded as the "end result of a chain of events at the beginning of which stands the gene." The mutant gene finds expression in morphology by the alteration of physiological processes of the cells of the developing embryo, reaching a critical level and exercising an observable effect only in the cells of a particular tissue or tissues at certain times.

In the present case one can imagine a somewhat similar interference with normal development, but possibly at a still earlier stage than in the mice, if the absence of the testis is to be ascribed to one factor acting simultaneously on the genital and renal tissue.

#### CONCLUSION.

While most of the individual features of this case have been recorded in the literature, some of them only rarely, a parallel of this specimen has not been found.

Absence of the testis and kidney may have a common aetiology, but only four instances of the association of these two defects have been reported (Collins, 1932). Stricture or atresia of the rectum was associated with absence of the kidney in seven cases, but no case was found in which the testis was also absent. In no report of these combined abnormalities was there a description of a stricture of the urethra causing such enormous distension of the bladder.

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## PATHOLOGY OF THE INTER-DIGITAL PILONIDAL SINUS.

By J. T. HUESTON.

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**O**CCUPATIONAL diseases are of interest both to the clinician and the pathologist. The possibility of claims for compensation makes it necessary to investigate fully their causation. The inter-digital pilonidal sinus is one of the less well recognized occupational diseases of our civilization.

Until five years ago the inter-digital pilonidal sinus had escaped mention in surgical literature. Patey and Scarff (1946) described a case as supportive evidence of the acquired nature of pilonidal sinuses in the post-anal region—an opinion that has been held in this School for some years. These writers pointed out the identical structure of the sinuses in these situations. Since then, several cases have been reported: Ewing (1947), Patey and Scarff (1948), Tait (1948), Wilks (1948), Sames (1948), King (1949), Matheson (1951), Jenkins (1951), Warren (1951), and Raw (1951).

### INCIDENCE.

This condition is almost completely confined to barbers. That it is quite common is soon apparent when the hairdressing population of a city is interrogated. A feature of such an investigation is that these sinuses are widely recognized amongst barbers and accepted as a sign of long practice in hairdressing. By a coincidence, both the hairdressers in a small saloon were found to possess inter-digital sinuses. The case described below is unusual in possessing a double lesion.

Of vast interest is the case reported by Matheson (1951); a shearer with a typical inter-digital sinus due to wool fibres. This is an excellent illustration of the extrinsic origin of these lesions.

### CLINICAL FEATURES.

The patient is always a man who has been a barber for many years. Usually the sinus

has been present for years without requiring medical attention and often the barber tells how he spends some time every night picking out hairs with forceps. Many cases have had one or more episodes of cellulitis or abscess formation requiring incision.

By far the commonest cleft involved is that between the ring and middle fingers; but sinuses have been observed in all four clefts. It is also noted that the opening is not always in the depth of the inter-digital cleft, but sometimes just dorsal to the web margin, and even half a centimetre into the palm of the hand.

Some sinuses have large openings on to the surface, but smaller sinuses have been observed to close completely and for weeks to be clinically invisible. In most long-standing cases it is possible to palpate the deep part of the sinus in the web space as a firm, round mass often the size of a pea.

Occasionally multiple sinuses are present in the one inter-digital cleft. This is consistent with the observed fact that hair fragments frequently penetrate at several points in a single cleft, even in the absence of true sinuses.

The left hand is slightly more often affected than the right, but there seems no positive correlation between the site of the lesion and the individual's habits of holding scissors or combs.

The following case history illustrates many features typical of this condition:

G.S., male, age 39 years, had been a barber for eighteen years. For the past five years he had noticed a tiny opening between the index and middle fingers of the right hand and another between the middle and ring fingers for the past three years. At night he often removed hair fragments from these openings. There had been two episodes of cellulitis of the third web space.



FIG. I. Inter-digital cleft between the index and middle fingers showing the single sinus opening. The deep part of the sinus was palpable in the web space.



FIG. II. Inter-digital cleft between the middle and ring fingers showing three tiny openings. Minute hair fragments are present in two of these.

On examination, two lesions were present. Between the middle and index fingers was a single sinus which admitted a very fine probe to a depth of half a centimetre (Fig. I). In the soft tissue of this web space was palpable a firm, rounded, non-tender mass nearly a centimetre in diameter. Between the middle and ring fingers (Fig. II) were 3 tiny openings, from which hair protruded at times, but no mass was palpable in this web space.

At operation, under general anaesthesia and with an avascular field, an ellipse of skin was excised, including the orifices, and the soft tissue of each web space dissected out in a block attached to the skin. The skin edges were sutured and healing occurred by first intention. The larger sinus was opened at operation and found to contain a small amount of pus and 6 tiny black hair fragments almost a centimetre below the skin surface.

#### HISTOLOGY.

This is identical with that of the pilonidal sinus in the post-anal region.

The main feature of the well-developed condition is a track lined by stratified squamous epithelium leading to a collection of hair fragments. The depths of the sinus may be lined by epithelium, but more commonly by granulation tissue. The stratified squamous epithelium lining the main sinus track is continuous with that of the adjacent skin and the corneous layer may fill the

cavity. In the depths of the sinus the epithelium is thinner and without a corneous layer (Fig. III).



FIG. III. Section showing stratified squamous epithelium deep in sinus. A hair fragment is seen in the connective tissue nearby with minimal inflammatory reaction. (x 35.)



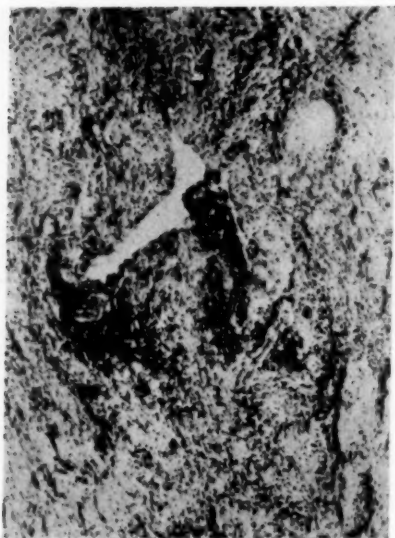


FIG. IV. Section in deep part of sinus showing cavity lined by granulation tissue. Note hair in nearby connective tissue. (x 36.)

There is little inflammatory reaction around that part of the track lined by epithelium, but local cellular proliferation and polymorphonuclear cell aggregation are pronounced round the deeper parts. The appearance of the deep part of the sinus is that of an abscess cavity lined by granulation tissue (Fig. IV). The lumen contains

some polymorphonuclear leucocytes and occasional hair fragments.

The most interesting feature is the presence of hair fragments in the subcutaneous tissue, quite outside the lumen of the sinus. Some of these hair fragments lie in the connective tissue without any cellular or vascular reaction apart from a local orientation of fibroblasts (Fig. VA): Other fragments have monocytes collected around them, and occasionally a giant cell (Fig. VC), while some actually lie in a space lined by connective tissue cells and containing some polymorphonuclear leucocytes (Fig. VD).

#### COMMENT.

Until the stimulus of the past war led to a closer study of the pilonidal sinus of the post-anal region, it was universally accepted as an embryological defect—a "congenital" lesion. However, the absence of these lesions until adult life, their multiple nature in some, their occurrence elsewhere as in the perineum (Smith, 1948), and the absence of growing hair in the sinus caused some reasonable doubt as to the developmental origin of this lesion. It is now five years since Patey and Scarff (1946) and King (1947) revealed the inadequacies of this theory and demonstrated the acquired nature of these pilonidal sinuses. However, no recognition of this advance in our knowledge of this troublesome condition has yet appeared in surgical textbooks.

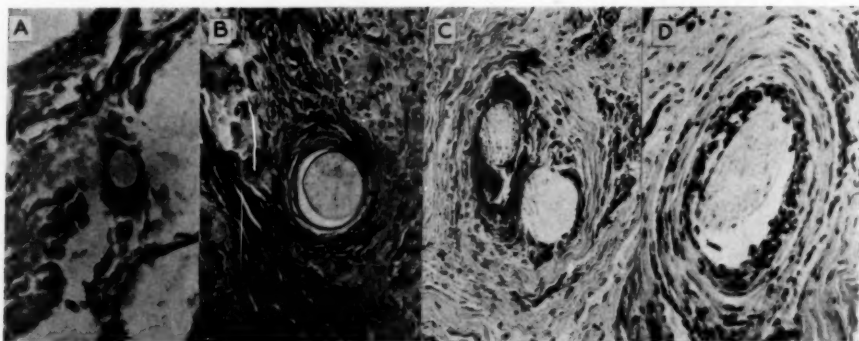


FIG. V. Sections showing degrees of connective tissue response to hair fragments. (x 80.)

- A. Hair fragment lying free in collagenous tissue,—no inflammatory changes.
- B. Orientation of fibroblasts around a hair, with some monocytes present.
- C. Giant cells of foreign-body type adjacent to hair, with space left by dislodging another hair fragment during preparation of section.
- D. Well differentiated wall of young fibroblasts surrounding lumen containing a hair fragment and some polymorphonuclear leucocytes.

Patey and Scarff (1946) first recognized the significance of the inter-digital pilonidal sinus of barbers. Here is an obviously acquired lesion which is clinically and pathologically identical with the post-anal pilonidal sinus. A beautiful piece of corroborative evidence!

The mode of production of the inter-digital pilonidal sinus emerges from the clinical and histological features described. Fragments of hair collect in the web spaces during hair-cutting. These fragments may penetrate the epidermis and reach the dermis. This entry is probably facilitated by the softened skin of the barber's hands which comes from frequent use of hair oils. Penetration of the conjunctiva of barbers by hair fragments was mentioned by Warren (1951). The hair may lie in the dermis, without producing any inflammatory reaction, or be discharged leaving a tiny opening into which further fragments may migrate.

A sinus lined by granulation tissue is established by the daily intrusion of hair fragments and, as in any chronic sinus, the epithelium of the skin provides a lining to its outer part. It seems likely that hairs migrate from the sinus into the subcutaneous tissues where a space, which later opens into the parent sinus, develops round them. This is possibly the mode of extension of a sinus. Recurrent bouts of cellulitis of the hand are likely in the presence of such a persistent foreign-body sinus.

The treatment of the inter-digital pilonidal sinus is, primarily, exclusion of the hair fragments. A piece of adhesive strapping in the web space is sufficient during working hours, and this protection may result in permanent closure of a sinus. Collodion would probably be equally effective. Excision of the sinus and the palpable deep

abscess is necessary in those cases which fail to close following simple exclusion. Repeated bouts of cellulitis, as in the case described, is an indication for excision during a quiescent phase. After excision, the barber should still ensure exclusion of hairs from the web space.

#### SUMMARY.

1. The clinical features and pathology of the inter-digital pilonidal sinus are described and a typical case history is recorded.
2. The treatment is briefly discussed.
3. The acquired nature of this lesion is emphasized as relevant to the origin of post-anal pilonidal sinuses.

#### ACKNOWLEDGEMENT.

I am grateful to Mr. Julian Smith for permission to operate on this patient.

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## Liber

Incipit liber primus Chirurgie magistri petri de Large  
laca de bononia artium et medicine doctoris.



## Rogaverunt me

Rogaverunt me socii mei ut scriberem legere eis rem  
nam et quartam sen, quartum cano  
nemis auiceme receptas ordina  
re sunt. Et quia amicus est ad  
ter ego copiosius et cogor eis co  
placere in h. amicis enim sit  
propter bonitatem et non pro  
pter aliud, quia propter ad cum  
qui est omnis boni possessor: et

omnis boni liberalis largitor recurro gratiam postulans  
et exquirens ut cor meum et mentem meam illuminare vi  
gnetur ut sit recta regula et mensura in hoc. Et una cum  
aurore in libello quem fecit de commendatione inel  
lectis naturalibus cum extracto loquar. Laudamus sit i  
quirit deus et perducit non ad id quod sit voluntas eius ut  
simus fecerunt primo. Et postea. Et hic est ut virgi  
nis ad hoc mihi auxiliium inuocem ut ipsa ad filium, si  
lius ad patrem: ponat peccata meas scilicet accitum  
habet omnis homo ad ipsum: ubi et quis est habens fili  
um et patrem, filius autem patri ostendit laus et vice  
ra, in autem peccata et vera certe nulla potest esse repulsa ubi  
ter et tanta sunt caritatis insignia. Et propter igitur filium  
vocaui patrem et omnibus nobis gratias munera et be  
nemerita largiri dignetur in hoc et in alijs peragendis.  
Et in hoc autem opere sic procedam: quia in hoc opere  
erunt sex libri. Et in primo libro persequar de capitulo  
in capitulo, ut auiceme procedit ipsum ordinando rubri  
cas et alia thesaurum antiquorum ponam: videntes ta  
men empiria rameri rose andicane et aliorum empiri  
corum: et scilicet ad simplicia aliqua me credendum: penes  
enim theoricam eius signis: ut me sepe rogauerunt. Et in  
secundo libro ego mentionem faciam de omnibus apo  
stomatibus a capite vsq ad pedes de quibus auiceme, in  
4. non fecit mentionem, et ponam semper signa. Et in ter  
tio libro ponam de vulneribus a capite vsq ad pedes  
vane modum vobis curandi et accidentibus succurren  
di. Et in quarto ego faciam mentionem de omnibus vl  
ceribus particularibus a capite vsq ad pedes: quia op  
nium membrorum de quibus auiceme, non fecit mentio  
nem. Et in quinto ego aliquid loqui volo de decoratione  
incipiens a capite vsq ad pedes. Et in sexto aliquid lo  
quar de dislocatione et fractura ossium et de his que po  
terit ad iungens aliquid anothomie. Et ego ista faciam  
solum ad memoriam mei et meorum sociorum: et non p  
per aliud quia loquar ut alij magistri mei locuti sunt et si  
non complete locutus fuero imputetur ignorantie mee et  
non alicui cause: stans tempore correctioni in isto et in omni  
bus alijs magistrorum maiorum meorum.

De humore.



## Regmon

Regmon vobis modo caput vno  
modocommunit pro om  
ni inflammatione preclari: et hoc voluit auiceme  
cui vixit. Et hanc qd nomen habuit in lingua gre  
corum est absolutum qd est et inflammationem. et hoc  
vult et ha. in primo de humore et sanguine. et hoc  
capit proprie pro apertis et sanguine. vero et puro genera  
to vel et alio curante curis et sic causis. Hec autem Reg  
mon. et modo accepta est duplex. scilicet vera et non vera. Vera scilicet  
est et sanguine benigno qd multo plus est indiget illis  
membri: est ergo talis sanguis peccat solo qualis. Non  
vere scilicet sit et sanguine non naturali et malo. peccat ergo  
in istis et istis. I quia non potest peccare solus. Et p notitia ho  
rum operum nota qd sanguis et humor calidus et humidus in  
substantia tempore et temperatione recti generamus.

## Primus

Est se duplex. scilicet calidus et humidus. calidus et hu  
midus, in substantia temperatus, in colore rubrus: in odo  
re et sapore amabilis. Et sanguis vero non naturalis est  
ille qd deat ut isto vltra terminos hoc latitudinis quos si  
transit non est sanguis naturalis. Ergo dicitur autem illos termi  
nos vno modo qd eius substantia efficitur magis grossa vel  
minus qd debeat. Alio modo est proprius terminos qua  
do subit aduritur, et grossum remanet absq remotione  
vel separatione isturum partium. Tercio modo est pro  
prio terminos quando aliquid aduenit ei de foris quod  
multipliciter potest fieri secundum qd multe sunt species  
colle flatus et melancholie que cum eo commisceri possunt. Et  
quibus dictis apparet qd et sanguine generatur quatuor  
et species apostematum, primo et sanguine benigno ge  
neratur non vera. Et secundo et sanguine illandabili per  
admissionem triplex generatur apostoma scilicet quatuor et tres  
humores tripliciter secum permisceri. unde si auicetur co  
lera cum sanguine vincente vocatur non crispulanda, et si  
flegma non videntur. et si melancholia non crispulanda.  
Et tertio et sanguine illandabili ratione sui modi subst  
antie: quia sanguis est vniuersalis vel grossus potest genera  
ri non que potest dici vera, et licet auiceme dixerit et sanguis  
illandabilis est subtilis vel grossus: quia et b videtur vel  
le sanguinem subtilem et grossum esse laudabilem, tamen  
vico ego qd iste sanguis non est laudabilis proprie et sim  
pliciter: est tamen laudabilis secundum quid, et b voluit  
auiceme, quomodo est laudabilis secundum quid, non modo  
quia illi cui inest naturaliter ut sanguis grossus inest in  
leucocico sibi sano naturaliter: et sanguis colicus inest co  
lerico sibi sano: non tamen absolute qd in compositione  
ad sanguinem temperatum naturalis et illandabilis est. Iste  
ergo sunt species apertis: et qd sit immutabilis patet: qd est  
proprie terminos sanguinis naturalis. Et quarto et san  
guine illandabili p aduentionem sui subleatatem et grossitatem  
sui generatur oca pustula et crustula vsq ad ethiopianum, ut  
sunt carbunculi pruna ignis plicis aut cancer ignis.

Et causa autem istius sunt tres scilicet prima et est in  
cilio aut fractura aut vicer anterior vltra que sunt in me  
bro et propter dolorem delectat materia ad locum et resi  
stunt in vijs vacuis et si flegma, est ergo causa extrin  
seca corpori. Causa ergo prima est res et quia pro  
prie disposicio aduenit primo aut non primo. Et causa  
secunda est antecedens: et illa est multiplex inter replectio  
nis humorales complexionalis et compositionalis: et quo  
patet qd mala complexionis et humorum causis antecedens, et  
similiter debilitas in combit, et aliter non delecto: quia ali  
ter hanc prolongare nolo: quia in quodlibet per me ordi  
natio me prolongat. Causa ergo antecedens est et quia  
provenit disposicio aduenit non primo. Et causa autem  
coniueta est ipse sanguis antecedens in loco et apostoma  
to appositio vel v.

Ad ergo plicia et ista et agnoscitur disposicio aduenit p.  
Et habet autem non quatuor tempora, principium, aug  
mentum, statum et declinationem. Principium declara  
tur per presentiam ipsarum causarum coniuetarum scilicet  
licet cum incipit apparere. Et augmentum cognoscitur  
p adfectionem magnitudinis et remissionis. Et statum autem co  
gnoscitur p aggregationem materis: et illic aggregatur mane  
ria si debet aggregari. Et declinatio est quando incipit de  
dere ad lenitatem et debilitatem, et si via maiorem decla  
rationem vide questiones per me factas de hoc. Et no  
ta qd ista tempora non minus debet notare qd gradum  
nem, unde ignoratio istius et cura gradum igno autem.  
Et notat auiceme, qd primi cum vixit tempore gradum  
est, ut sciamus in quo tempore est gradus, verbi gratia  
si gradum est in principio super istum apponimus qd ibi  
lum reperimus. Et terminatur autem apostoma quatuor  
et modis, primo modo p resolutionem, secundo p simu  
lationem, 3. p putrefactionem, 4. p purgationem, primus  
declarat ad autem, cui vixit: et in quibus ista illud qd rati.

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## THE CIRURGIA OF PIETRO D'ARGELLATA.

By K. F. RUSSELL

*Department of Anatomy, University of Melbourne.*

VERY little is known about the life of Pietro d'Argellata, who was one of the prominent Italian surgeons during the latter portion of the XIVth and early part of the XVth centuries. His period of active surgical practice immediately follows that of Guy de Chauliac and he was Guy's most distinguished pupil. At the height of his career Pietro occupied the combined Chairs of Logic, Astrology and Medicine at the University of Bologna. In 1415 he performed a post-mortem examination on Pope Alexander V and subsequently embalmed the body. Pietro died on 20th January, 1423.

It is not known when his book first appeared in manuscript, nor are many copies extant to-day. There is one manuscript copy in the Army Medical Library, Washington, dated 8th August, 1466, and although there may be others in existence they are not easy to find.

His *Cirurgia* first appeared in print in Venice on 9th August, 1480, and was reprinted in the same city on 28th April, 1492, 22nd February, 1497/8, and 12th September, 1499. Later editions appeared in Venice in 1513, 1520, 1531 and 1541.

His book is frankly a compilation from other authors, at least thirteen being quoted in the text. Of these some are quoted more often than others, for example, either Avicenna, Lanfranc, Albucasis, Galen or Guy de Chauliac are mentioned on almost every page. However, although he freely acknowledges the work of others, his book contains much original thought and work. He was, apparently, a skilled surgeon and operated upon patients for urinary calculi, fistulae of various forms, herniae and dental conditions. He performed Caesarean section and in cases of ante-natal death of the foetus he dilated the *os uteri* and manually extracted

the child. He used various types of suture material and perforated metal drainage tubes. Whereas Guy de Chauliac would direct others to do post-mortems and embalming and the midwives to do the obstetrical operations, Pietro would do them himself.

His book is longer than that of Guy de Chauliac, is more practical and if one can use the term more "surgical"; but, it must be remembered that it was written twenty or thirty years later than Guy's.

The book commences with seven chapters of general surgical interest, then follow chapters devoted, amongst others, to ulcers, abscesses, wounds, hernia, diseases of urinary and genital organs, scabies, umbilical hernia, leprosy, phlebotomy, purgation, fractures in general and of the skull in particular, and finally on the use of the cautery.

One of the chapters (*de solutione continu- itatis nervorum*) is of extreme interest, for in it Pietro discusses the effects of injury to nerves. Amongst other facts he makes a clear cut distinction between nerves which are severed and those which are compressed and contused. In some parts of the chapter, however, it would appear that Pietro is confused between actual nerves and tendons.

The College possesses the following issue of Pietro's work:—

*Cirurgie magistri petri de Largelata de bononia artium & medicine doctoris.*

Colophon:—

*Venetis 1499 die 12 Septembris  
folio. 131 leaves.*

It will be noted that the author's name is spelt differently on the title. This is one of the many variants of his name which is listed as Petrus Argelata, d'Argellata, de Argillata, de Arzelata, de la Cerlata, or Arzilata.

The first page appears as an illustration, and it will be noted that the capital letters at the commencement of the chapters are now printed instead of being supplied in manuscript as in the work of Guy de Chauliac previously illustrated.

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## CASE REPORTS.

### POST-TRAUMATIC CYST IN THE GLUTEAL MUSCLES.

By D. R. LESLIE.

*Royal Melbourne Hospital.*

**A**PART from enlarged bursae, cystic swellings in the gluteal region are uncommon. This case presented a clinical problem in diagnosis and some interesting pathological features.

#### CLINICAL FEATURES.

A married woman, aged 46, of massive build, reported with a swelling in her right buttock which followed two definite injuries. The injuries, which occurred four and two months earlier, were in each case a fall on to the buttock. She said that the swelling had been enlarging and that there was some pain when her clothes rubbed across it. She had never received intra-muscular injections in this region.

On examination, there was a large, smooth swelling in the right buttock, ovoid in shape with its long axis running downwards and outwards. The skin moved freely over it; the edges were difficult to feel as though the mass were beneath the deep fascia; and, although the swelling was fluctuant, it could not be trans-illuminated. Movements of the hip and lumbar spine were free and painless.

#### MANAGEMENT.

Under local anaesthesia some 50 cc. of clear, jelly-like fluid was aspirated from the cyst. This fluid clotted completely but the

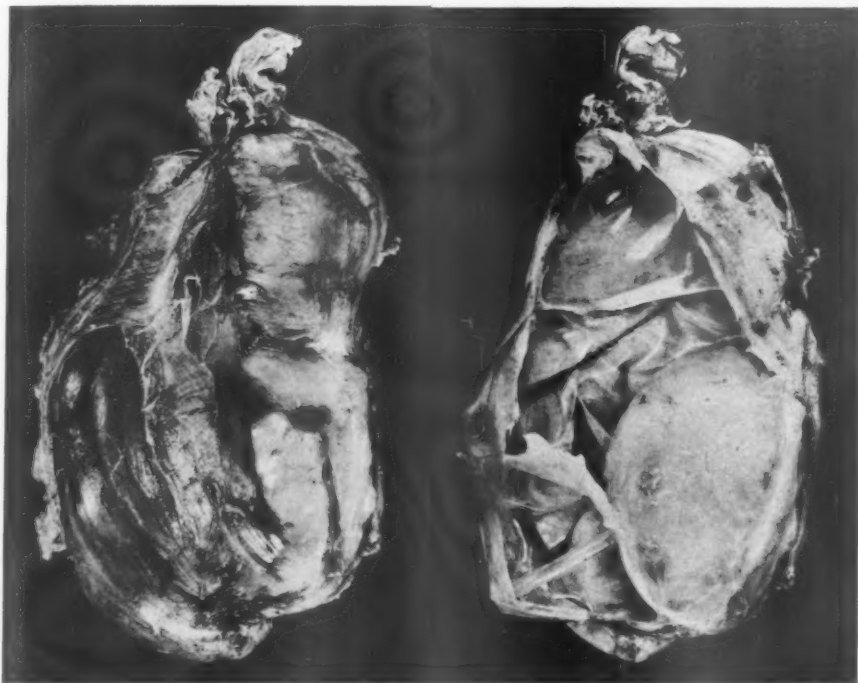


FIG. I.

FIG. I. Photograph of the specimen as viewed from the exterior. Strands of muscle tissue are seen closely attached to its surface.

FIG. II.

FIG. II. Photograph of the specimen after it had been incised. It is seen to be multi-locular and one loculus is filled with very thick mucoid material. In this, strands of tissue which were interpreted as being muscle were to be seen. Most of the content was very fluid and escaped when the cyst was opened.

clot remained soft. On microscopic examination it was found to consist of a coagulated matrix containing scanty cells—some of these had the appearance of normal blood cells (erythrocytes, lymphocytes and monocytes), but there were also a few cells of about 10-15  $\mu$  in diameter with single nuclei and vacuolated cytoplasm which were regarded as macrophages. Microscopic examination and culture failed to reveal tubercle bacilli.

The mass was excised under general anaesthesia. It proved to be a cyst situated within the substance of the gluteus maximus muscle, its long axis being parallel with the muscle fibres. Following this operation the wound healed by first intention and no disability resulted.

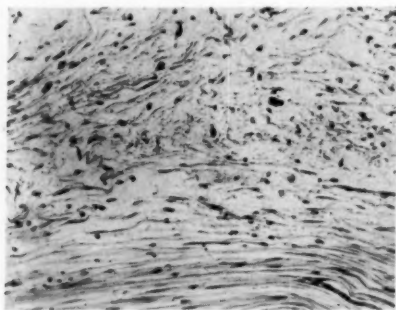


FIG. III. Photomicrograph of section of part of the wall of the small loculus showing (at the bottom) fibrillary tissue which was fibrous and had replaced muscle tissue. This merges into a typical mucoid material. (x 40.)

#### PATHOLOGICAL EXAMINATION.

The specimen consisted of an irregularly ovoid mass, fluctuant and translucent and measuring 16 by 10 by 7 cm. (Fig. I). The wall was irregular in thickness but thin in most places; and there were strands of muscle fibres on the surface which appeared to form part of the wall. After incision (Fig. II), the cyst was seen to be obviously multi-locular in form, most of the loculi containing a thick glairy fluid which escaped leaving a smooth inner surface. One part, consisting of a loculus measuring 7 by 5 cm., contained a more solid mucoid material in which there was some firm laminated tissue suggesting degenerated muscle.

Histologically the cyst wall was composed of fibrous tissue with some muscle fibres amongst it on the outer aspect. The outermost of these were well formed and clearly recognizable, but towards the inner part of the wall these became more fibrillar and disintegrated; in the inner part only collagenous connective tissue was recognizable. On the inner aspect there was, in some areas, a gradual change into a mucoid material, the tissue becoming more and more fibrillar and tenuous with homogeneous material between the fibres. In some areas the tissue was composed of a typical mucoid material—a fibrillar tissue with a large amount of basic-staining homogeneous substance between the fibrils, and numerous cells of stellate form (Fig. III). In other parts the transition was more abrupt and there was a definite inner margin to the wall, this margin having a surface like that of synovial membrane (Fig. IV).



FIG. IV. Photomicrograph of section of part of the wall of a larger loculus. There is a well defined margin which is, histologically, synovial in form. (x 40.)

In the middle of the small loculus mentioned, some of the fibrillae ran parallel and resembled those that lay close to the muscle fibres in the outer wall; and there was an occasional muscle fibre to be found in this region.

There was no evidence of recent haemorrhage nor of any inflammatory process.

#### DISCUSSION.

When first seen, the clinical diagnosis in this case appeared to be between a cold abscess, an enlarged bursa (possible of

tuberculous origin) and a lipoma. These possibilities were all excluded by the aspiration of fluid and its examination with the microscope. The actual origin of the cyst was not realized before operation; it was considered that it might be a hydatid.

Pathologically, the morphological features of this cyst clearly show the kind of change that has occurred in the muscle. There has been a disintegration, in some parts, of a considerable mass of muscle as indicated by the presence of muscle cells in the middle of one loculus and the evidence, macroscopic and microscopic, of change in a significant amount of muscle tissue.

The final change is that from an ordinary fibrous connective tissue into a typical mucoid tissue; in this case the connective tissue was that lying between the fibres of the muscle, and possibly the actual cells of the sarcolemma. In some places this changed tissue remains typically mucoid in form, but in other places, where this material has become much more fluid, the fibrous tissue of the wall has become "synovial" in character. This is a phenomenon that is observed frequently in subcutaneous tissues in the formation of false bursae.

The stimulus necessary for the production of this kind of tissue is not well understood. It is known, of course, that false bursae occur in places where there is pressure and movement, such as where people carry heavy objects or rest the weight of the body on small areas. It is noteworthy that cysts of this kind in muscle or in the subcutaneous tissue are found usually in the lower part of the back or in the gluteal region—that is, where the body is resting on the injured part and where movement is likely to occur in it. It seems probable, therefore, that the mode of formation is that a haematoma is formed, with or without destruction of tissue, and that intermittent pressure with a sliding component provides the stimulus for the development of a mucoid tissue instead of the normal absorption or organization of the blood clot. It is not suggested that this is the only factor in such a development, but it is probably a very important one.

Whether a certain amount of muscle is destroyed in the original injury or whether, owing to alterations in blood supply, some degeneration occurs at a later stage in the process, cannot be determined with certainty from the available material.

## A CASE OF MULTIPLE PRIMARY NEOPLASMS.

By J. A. FORBES.

*Department of Pathology, University of Melbourne.*

**C**ASES of multiple primary neoplasms, although uncommon, are not rare but this case in which four neoplasms, which may be regarded as primary, were found at post-mortem, is a curiosity.

The patient was a female aged 64 who developed symptoms and signs referable to a pelvic mass nine months prior to her death. There was no post-menopausal uterine haemorrhage.

Her previous history was uneventful except for a thyroidectomy for a large benign goitre nine years before.

A laparotomy had been performed five months prior to her death. A large ovarian cyst was found on the right side and considered to be an inoperable carcinoma. At this time, pelvic lymph node metastases were observed. The patient subsequently received a course of deep X-ray therapy.

At first, there was asymmetrical swelling of the legs due to pelvic venous obstruction, later, three months after laparotomy, she developed ascites and about three weeks prior to death severe obstructive jaundice became apparent.

No cerebral signs were observed.

### *Post-mortem Examination.*

Post-mortem examination revealed a large multi-loculated cyst, 25cm. by 20cm., replacing the right ovary, a carcinoma situated in the luminal layers of the uterus, an infiltrating carcinoma of the gall bladder and finally, a classical auditory nerve tumour in the left cerebello-pontine angle.

There were metastases in the lymph nodes draining the pelvis and also the gall bladder region. The peritoneum was studded with a few metastatic deposits and both suprarenal glands contained carcinoma tissue. The right suprarenal was obscured by a mass of yellow tissue 10cm. by 5cm. in diameter, whereas the left suprarenal contained multiple deposits of white tissue about 2cm. in diameter. The portal tracts of the liver, which was deeply bile stained, were diffusely infiltrated by carcinoma cells. The veins at the brim of the pelvis on the right side and the right ureter were partially obstructed by carcinoma tissue leading in the second case to gross unilateral pyonephrosis.

### *Microscopic Examination.*

The uterine carcinoma was found on microscopic examination to consist mainly of clumps of large spheroidal shaped cells infiltrating the myometrium.

The carcinoma of the gall bladder, on the other hand, varied considerably in its appearance, consisting of well formed gland-like structures lined by columnar epithelium in some places, whilst, in others, there was extensive mucoid change. The auditory nerve tumour had the microscopic appearance of a neurilemoma and no evidence of malignancy could be found in the ovarian cyst.

The carcinoma cells present in the suprarenal glands were similar in type to those of the gall bladder and, although there was a great difference in the macroscopic appearance of the two suprarenal glands, this was not confirmed microscopically.

### *Comment.*

The final diagnosis was primary carcinoma of uterus, primary carcinoma of gall bladder with metastases in lymph nodes, suprarenals, and portal tracts. Multi-loculated cystadenoma of the right ovary and auditory nerve tumour.

### *DISCUSSION.*

The literature contains numerous accounts of cases of multiple primary carcinomata as distinct from the tumours of multicentric origin.

The incidence of these is reported variously as from  $\frac{1}{2}$  to 4 per cent. of all carcinomata. The association of malignant and benign tumours is probably more frequent.

Usually there are not more than two tumours and, in the majority of cases, one of them is cutaneous. With the exception of these, the tumours are very often confined to the same system, for example, oesophagus and stomach or rectum and similarly multiple tumours of the same or paired organs are found relatively frequently.

Ewing reports statistical analyses from the U.S. Census in which the occurrence of multiple malignant tumours was found to exceed the frequency which may be expected coincidentally. He, however, is sceptical of the reports and, further, denies the validity of the analysts' conclusion that this is an indication that certain persons possess a special predisposition to cancer.

Orr, who has indicated fallacies in the interpretation of such figures, reached the conclusion that the incidence of multiple malignant tumours was in the vicinity of 1 per cent. He concluded that they have no aetiological relationship and occur purely as the result of coincidence.

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## A CASE OF CARDIOSPASM FOLLOWED FOR ALMOST TWENTY YEARS.

By RICHARD FLYNN.

Sydney.

**T**HIS case was recorded in this Journal (Flynn, 1939), as one of a series of cases of cardiospasm treated by dilatation. It is of some interest to record the case again as it has been followed for almost twenty years.

Dr. Anderson Stuart, on radiological examination after an opaque bolus, reported a greatly dilated oesophagus, which he considered as being due to cardiospasm. Fig. I shows a reproduction of the skiagram taken on that date, with huge dilatation of the oesophagus as high as the second thoracic vertebra.



FIG. I. Skiagram taken when first seen in 1930 showing huge dilatation of the oesophagus as high as the second thoracic vertebra.



FIG. II. Skiagram of the same case taken in Sept., 1949, showing the oesophagus contracted as compared with the skiagrams taken twenty years previously.

### *Original Case History, January, 1930.*

A.S.T., a male, aged thirty years, was first seen in consultation on 25th Jan., 1930, complaining of difficulty in swallowing and loss of weight from 65.7 kilograms (10 stone 6 pounds) to 49 kilograms (7 stone 11 pounds) in twelve months. He had also had severe epigastric pain, which had previously been diagnosed as due to gall-stones, and arrangements had been made for their removal. He experienced the same difficulty in swallowing fluids as he did with solids. He vomited after meals, and the vomitus was bitter. The duration of the symptoms was twelve months, and he felt that his condition was becoming worse. General examination disclosed nothing abnormal except obvious signs of a considerable loss of weight.

On 27th Feb., 1930, his oesophagus was dilated with a Plummer dilator; he was immediately able to swallow all types of food without difficulty, and on 30th May, 1934, he reported himself as being very well and having no difficulty in swallowing. Since the dilatation, his weight has increased to 56.7 kilograms (9 stone). X-ray examination after an opaque meal on that date showed the stomach and duodenum to be normal, with an evacuation time of four hours, and no evidence of cardiospasm. After twenty-four hours all the meal had reached the large intestine. On account of the normal emptying of the oesophagus, it was impossible to get a skiagram of it using the ordinary barium meal as the opaque medium. Accordingly, a very thin barium meal was given, and the skiagram showed marked recovery in tone of the oesophageal wall with a complete absence of dilatation.

*Subsequent History.*

The patient did not report again until September, 1949, when he complained of some difficulty in swallowing. After a barium meal, Dr. Badham reported: "There is very marked obstruction at the lower end of the oesophagus at the cardio-oesophageal junction and there is dilatation of the oesophagus above this. There is thus an organic constrictive lesion in the situation mentioned which I think is probably spastic in nature. However, I would suggest visual examination or further skiagrams in three or four weeks" (Fig. II).

On 12th Sept., 1949, he was again dilated over a swallowed string and this gave him relief. His weight on 16th Sept., was 9 stone three and one-quarter pounds. He has not had any further trouble in swallowing.

This follow-up is reported because comparison of the X-rays on the first and last occasion shows how the oesophagus has contracted down in the interval and thus answers a question which has been frequently asked "what happens to the dilated oesophagus after a successful dilatation."

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## Books Reviewed.

### ROYAL NORTHERN OPERATIVE SURGERY.

By THE SURGICAL STAFF OF THE ROYAL NORTHERN HOSPITAL. Second Edition. London: H. K. Lewis and Co. Ltd. 7" x 10", viii plus 638 pp., 498 illustrations. Price: £4 10s. nett.

This well bound and beautifully printed volume contains many excellent illustrations, some of which are in colour. The editor, Sir Lancelot Barrington-Ward has gathered together in sufficiently condensed form, standard operative procedures as practised at the Royal Northern Hospital.

The surgery of the parotid gland reflects the recent work and writings of Hamilton Bailey namely, dissection of the facial nerve. For pharyngeal diverticula, operation in two stages is advised. There is a useful description of a block dissection of the glands of the neck. Not everyone would agree that the diathermy knife is a safe instrument in thyroid surgery, nor that the removal of a thyroglossal cyst is as easy as it is made to appear. Otherwise, the section on the thyroid is well done, especially the salutary passages in the text and also illustrations of the recurrent laryngeal nerves, and the manner in which they may be damaged in goitre operations.

Thoracic surgery is given relatively small space and diaphragmatic hernia is dismissed in a few lines.

The operations in abdominal surgery as described, are good in parts, but sections on such matters as reconstruction of the common bile duct are poor, probably this is because such operations are rarely necessary in Great Britain.

Operations on surgery of the colon are well described and beautifully illustrated, and the section on hernia is one of the best and most succinct in the English language—the writer talks sense.

No mention is made of dangerous abnormalities encountered in operations on varicose veins. A proximal injection of Ethamolin would not be accepted by many Australian surgeons. Arteriotomy is advised for incipient Volkmann's paralysis. The obsolete operation of appendicostomy absorbs two and a half pages, as much as is devoted to a description of appendicectomy and its modifications. The out of date ileostomy loop continues to be described (most dangerous teaching). The double barrelled simple type with immediate section and drainage of the small gut is not mentioned. Splenectomy is described as an abdominal operation and no mention is made of the use of the thoracic approach or the means of dealing with adhesions. It is all too simple to be true.

The section on orthopaedic surgery is very good and should be of value to the general surgeon, as is also the neurosurgical and urological. The surgery of the sympathetic nervous system is patchy. Gynaecological operations are dismissed in a few pages and are confined almost entirely to those which would be done by an abdominal surgeon, not a gynaecologist.

The book is a useful companion for a resident surgical officer in a general hospital, and perhaps

the general practitioner surgeon. There is not enough detail for the good general surgeon in this country, nor are the pitfalls in surgery sufficiently stressed. Surgery is learnt in a hard school and a long apprenticeship. However, this book can be recommended as suitable for a candidate for higher degrees who is preparing himself to learn surgery. Of its kind, it is one of the best books which has appeared in recent years.

### DISEASE IN INFANCY AND CHILDHOOD.

By Professor RICHARD W. B. ELLIS, O.B.E., M.A., M.D., F.R.C.P. Edinburgh, Scotland: E. and S. Livingstone Ltd., 1951. 10" x 6", vii plus 695 pp., 300 illustrations. Price: 42s. nett.

Professor Richard Ellis has succeeded in producing a text book on disease in infancy and childhood which compares favourably with any issued during the last decade. It is most comprehensive, concise and up to date. It is easily read, aided no doubt by the clarity of the print. The illustrations are numerous and excellent, and the subject matter well arranged, mainly according to age periods.

Almost an original idea in a text book of this nature is the grouping of congenital malformations of all systems, in one chapter occupying about one-fifth of the book. In respect to the treatment of these deformities and other problems involving paediatric surgery, no attempt is made to enter into details. The author modestly regards his production as an introduction to clinical paediatrics for those already familiar with the natural history of disease processes in adult life. As a matter of fact, it should be in the hands of hospital residents, practitioners and even specialists, who will derive much stimulation from it. Medical treatment is according to the latest approved methods, and each chapter has a liberal bibliography and references.

### REVIEW OF PHYSIOLOGICAL CHEMISTRY.

By HAROLD A. HARPER, Ph.D. Third Edition. California, U.S.A.: University Medical Publishers, 1951. 10" x 7", 260 pp., with 13 figures, 23 tables. Price: \$3.50.

The rapid development in our knowledge of living processes makes it almost impossible to write a comprehensive and up-to-date treatise on biochemistry. The recent trend towards annual reviews on specific topics does allow a more rapid dissemination of new findings, but it does not overcome the difficulties associated with the broader perspective. The presentation of the field in synopsis form serves a useful purpose at the present time, and the review by Harper is an excellent example in which a well-balanced approach has been maintained in the space of 260 pages.

The book is recommended for new students who wish to establish a sound background for study courses in physiology and biochemistry, and also for graduates who desire to keep abreast of latest developments. Although the expert might consider that his own topics have been dealt with too briefly, the review must be judged on its general balance; the aims outlined by the author have been achieved.

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